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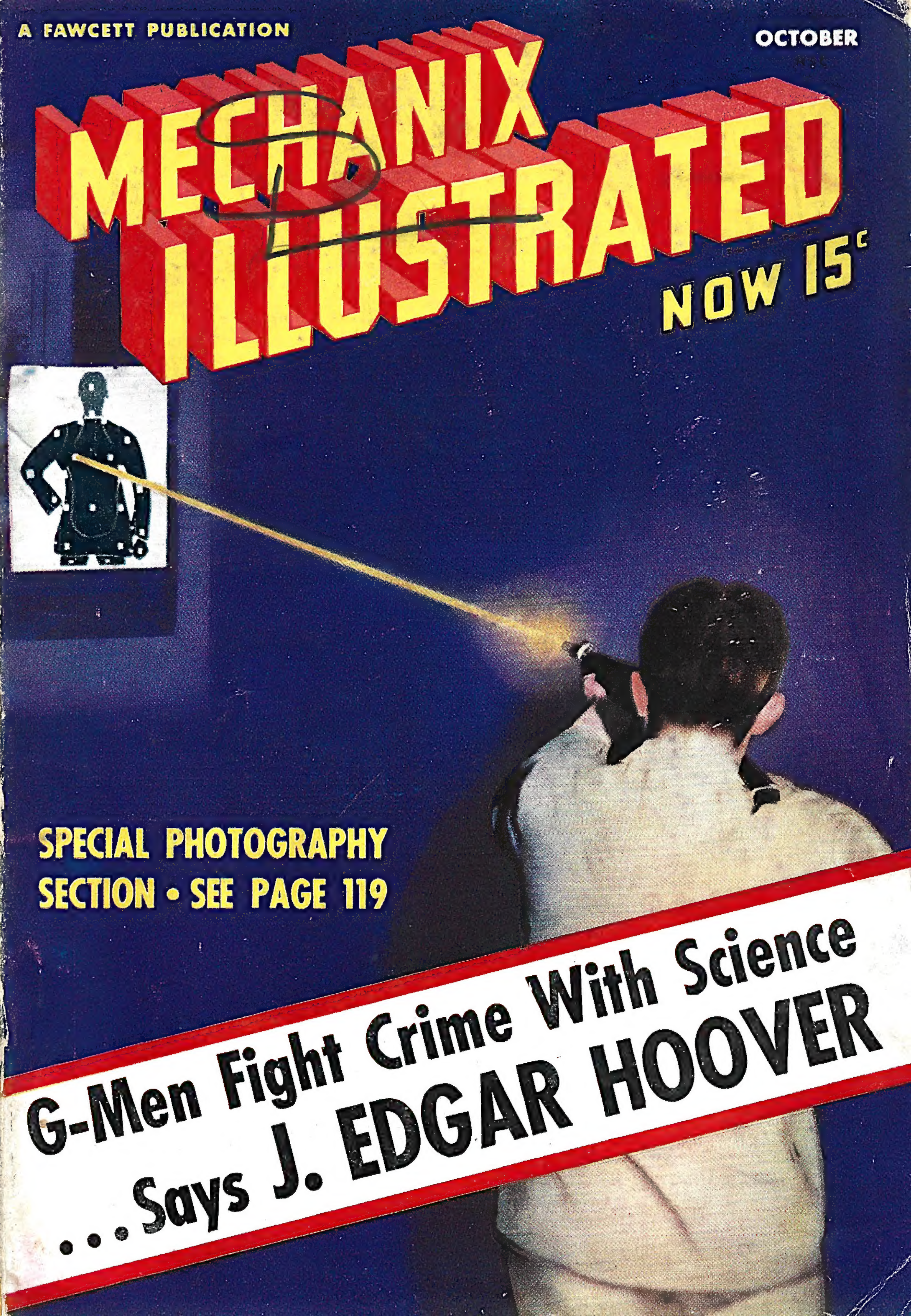

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G-Men Fight Crime With Science ...Says J. EDGAR HOOVER

OCTOBER 1938
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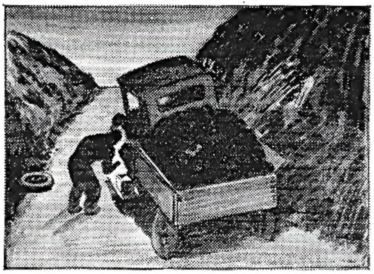
TRAPPED IN THE PATH OF BLIND DEATH!

JALMER KRAPU

North Dakota Farmer Faces Doom, Pinned Beneath Disabled Truck

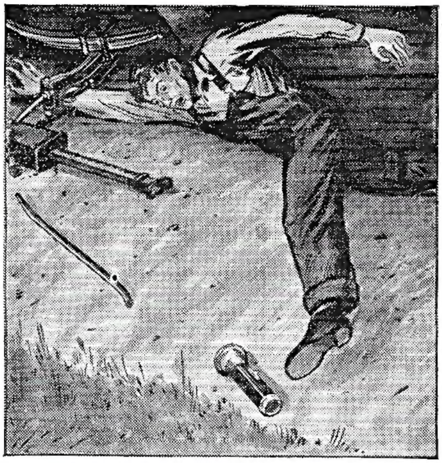
❶ "I was coming home from town one night with a load of coal on my farm truck," writes Jalmer Krapu, of La Moure, N. D., "when, a few feet from the top of a steep hill, a front wheel came off.

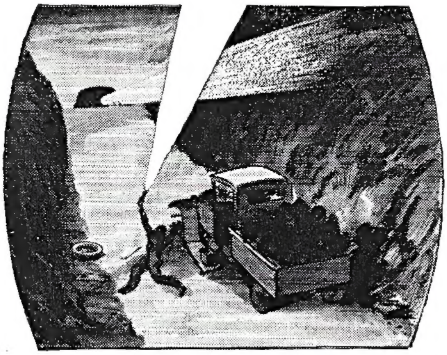
❷ "In the tool box, I found an old flashlight I hadn't used for months and was surprised to find it gave a strong light. I got out the jack and some other tools, then carefully put out the light to save the juice till I needed it more, and laid the flashlight on the road. My headlights ran on the magneto and so had gone out when I stopped.



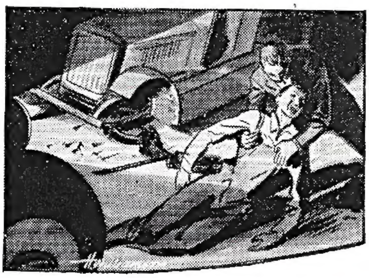
❸ "I had the jack almost to its full height when it slipped, the axle crashed down to the road again, pinning my arm beneath it. As I lay there helpless in the dark with my head against the road, I heard a car coming.

"In a few seconds he would be over the crest of the hill and roaring down on me. I *had* to warn him before he reached the hill top . . . or it would be too late! I was square in the middle of the road, *and death was on its way* . . . certainly for me, perhaps for others, too.



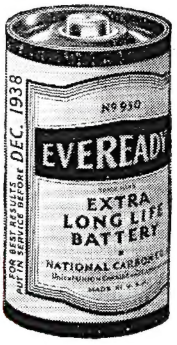


❹ "I thought of the flashlight lying there on the road . . . but I couldn't reach it! I stretched out toward it as far as I could, managed to touch it with the toe of one foot. I thought my arm under that axle would break as I strained for the light and finally kicked it to where I could reach it with my left hand, snap on the light and wave it above the crest of the hill to warn the approaching driver.



❺ "Those *fresh* DATED 'Eveready' batteries rescued me from as desperate a trap as a man could be caught in. Thanks only to them I got off with only a lame arm when my number seemed to be up.

(Signed) Jalmer Krapu"



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Number 6

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THE MUMMY-CLOTH MYSTERY

IMAGINE a textile fibre 8½ times stronger than cotton, 6 times stronger than silk, 4 times stronger than flax or hemp that grows like cane and gives 3 to 5 crops a year! This is Ramie, an enigma to science for 56 centuries. It has been variously called iron-cloth, China-glass and kari-mushi. The story of Ramie, or mummy-cloth, is one of romance and wonderwork. It will be told next month in MECHANIX ILLUSTRATED.

HAIL as big as baseballs that rain from heaven in a storm of death is the subject of "Hail from Heaven" also to be told in November. Look, too, for Flash Williams' own story, "I Risk My Neck for a Thrill." Read about Flash's narrow escapes as a dare-devil driver and of his "return from hell" stunt.

Coming

Be sure and read the details of the nation-wide Paramount-Fawcett Publications Prize Contest which will appear in the November issue. The contest is one that every MI reader can enter and will be based on events portrayed in Paramount Pictures' new production, *Men With Wings*, the first All-Technicolor aviation picture ever filmed!

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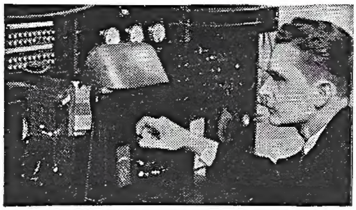

Broadcasting Stations
Employ managers, engineers, operators, installation and maintenance men for fascinating jobs and pay up to $5,000 a year.

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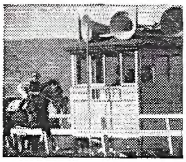

Loud Speaker Systems

Building, installing, servicing and operating public address systems is another growing field for men well trained in Radio

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H. W. SPANGLER, 126½ S. Gay St., Knoxville, Tenn.

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Many Radio Experts Make $30, $50, $75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Fixing Radio sets in spare time pays many $200 to $500 a year—full time repair jobs with Radio jobbers, manufacturers and dealers as much as $30, $50, $75 a week. Many Radio Experts open full or part time Radio sales and repair businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Automobile, police, aviation, commercial Radio, loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I trained have good jobs in these branches of Radio. Read their letters. Mail coupon.

There's a Real Future in Radio for Well Trained Men

Radio today is young—yet it's one of our large industries. More than 28,000,000 homes have one or more Radios. There are more Radios than telephones. Each year millions of Radios get out of date, need replacing or new tubes, repairs. Millions are spent each year for Radio repairs. More than 5,000,000 auto Radios are in use; more are being sold every day, offering more profit-making opportunities for Radio experts. And RADIO IS STILL YOUNG—GROWING. Radio is expanding into other fields. The few hundred $30, $50, $75 a week jobs of 20 years ago have grown to thousands. Yes, Radio offers opportunities—now and in the future!

Many Make $5, $10, $15 a Week Extra in Spare Time While Learning

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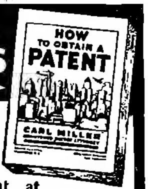
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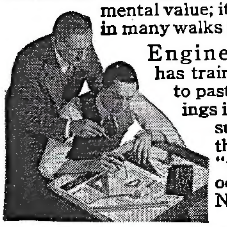

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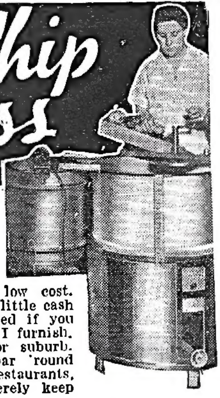

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Why Trained Accountants Command High Salaries

—and how ambitious men are qualifying by the La Salle Problem Method

GET this straight.

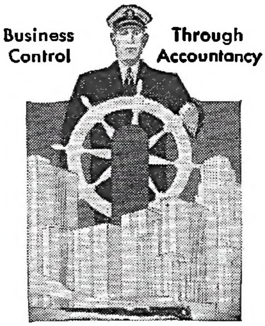
By "accountancy" we do not mean "bookkeeping." For accountancy begins where bookkeeping leaves off.

The skilled accountant takes the figures handed him by the bookkeeper, and *analyzes* and *interprets* them.

He knows how much the costs in the various departments should amount to, how they may be lowered.

He knows what profits should be expected from a given enterprise, how they may be increased.

He knows, in a given business, what per cent of one's working capital can safely be tied up in merchandise on hand, what per cent is safe and adequate for sales promotion. And these, by the way, are but two of *scores* of percentage-figures wherewith he points the way to successful operation.



He knows the intricacies of government taxation.

He knows how to *survey* the transactions of a business over a given period; how to show in cold, hard figures the progress it has made and where it is going. He knows how to *use* these findings as a basis for constructive policies.

In short, the trained accountant is the *controlling engineer* of business—one man business cannot do without.

Small wonder that he commands a salary two to ten times as great as that of the bookkeeper. Indeed, as an independent operator (head of his own accounting firm) he may earn as much as the president of the big and influential bank in his community, or the operating manager of a great railroad.

Some Examples

Small wonder that accountancy offers the trained man such fine opportunities—opportunities well illustrated by the success of thousands of LaSalle accountancy students.* For example—one man was a plumber, 32 years old, with only an eleventh grade education. He became auditor for a large bank with an income 325 per cent larger.

Another was a drug clerk at $30 a week. Now he heads his own very successful accounting firm with an income several times as large.

A woman bookkeeper—buried in details of a small job—is now auditor of an apartment hotel, and her salary mounted in proportion to her work.

A credit manager—earning $200 a month—moved up quickly to $3000, to $5000, and then to a highly profitable accounting business of his own which netted around $10,000 a year.

And What It Means to You

Why let the other fellow walk away with the better job, when right in your own home you may equip yourself for a splendid future in this profitable profession?

Are you really *determined* to get ahead? If so, you can start at once to acquire—by the LaSalle Problem Method—a thorough understanding of Higher Accountancy, master its fundamental principles, become expert in the practical application of those principles—this without losing an hour from work or a dollar of pay.

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- ☐ **Modern Salesmanship**
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Present Position__________________________________

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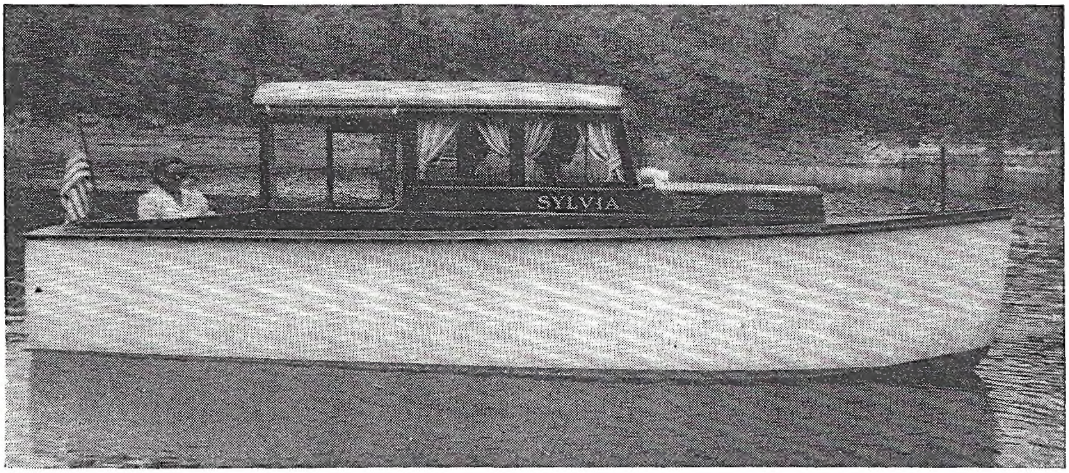
*Names available on request.

Chips from the Editor's Workbench



Graceful lines and good craftsmanship are evident in this 20½-foot cabin cruiser which was constructed by W. W. White.

I ALWAYS appreciate good craftsmanship when I see it, so it didn't take me long to make up my mind to send this month's $5 Workbench award to W. W. White, of Lexington, Ky., who sent in a photo of his home-built cabin cruiser. White built the boat to his own plans, powering it with a converted Model-T Ford engine which enables the craft to speed along at 15 m.p.h An extra generator, driven by a V-belt from the engine, supplies plenty of current for the starter, lights and radio.

Despite its size—20½ feet long with six-foot beam—the V-bottomed boat required only 14 months of spare time work to build. The trunk cabin contains a toilet and the power plant, while the deck cabin contains a galley and a seat that opens up to form a full-size bed. The rear cockpit, which is covered by a knock-down top in bad weather, has a seat under which an ice box is built. A swell job, White, and my sincere compliments accompany the check MI has sent to you.

***

Proving that lack of a regular workshop is not an obstacle to a sincere craftsmen, the professional-looking powered scooter shown here was constructed by Joseph J. Cordina within the confines of his New York City apartment! Joe used channel iron for the chassis of his scooter, fitting it with a three-quarter horsepower engine that drives it along at a speed of 35 m.p.h while giving mileage of about 90 miles per gallon. The handle bar and fork are made of steel tubing and the body is made of galvanized sheets capable of supporting a weight of 250 pounds. With the $3 check I'm sending you, Joe, you ought to be able to buy enough gas to go half way across the country.

***

If you are one of that class of craftsmen who are looking for "something different," be sure and read the article entitled "Building Bottled Boats,"

[*Continued on page* 12]

His apartment served as a workshop for Joseph Cordina when he constructed this powered scooter. It travels at 35 m.p.h.

THESE FREE BOOKS ARE FOR INVENTORS

AND OTHER MEN WITH IDEAS

"We're only entering the great period of inventive advancement"
—says C. F. Kettering, Vice Pres., General Motors.

SOMETIMES we hear people say: "Well, there isn't much left to invent." But Charles F. Kettering, Vice-Pres. and head of Research of General Motors, who helped develop the self-starter, Duco and many other outstanding inventions, **doesn't think that at all.** Not long ago in a published statement, he said:

"If we took half the men employed in tool making and put them to working out new inventions, new things, we could snap out of this depression in no time. Our return to normal times depends on new manufactured products that will catch the purchaser's eye, get him to buy and thus start the ball rolling. Change and buying go together. *We are only entering the great period of inventive advancement.*"

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Some of the world's best inventions came from men who didn't consider themselves inventors at all. The telegraph was invented by a painter, the typewriter by a farmer, the hand camera by a bank-clerk, the stock ticker by a dentist. Or look at small inventions. A husband noticed his wife bending a hair pin to make it stay put. That gave him the idea of the crinkly hair pin. One day a golfer got the idea to make a wooden tee. Now wooden tees are sold by the millions every year. There are many similar examples in inventive history. That is why we say that the books shown here are for INVENTORS and Other Men with IDEAS. Whether you consider yourself an inventor or not—**if you have an idea that will make money, save time, save labor, or give pleasure**—find out how you can protect your rights to it.

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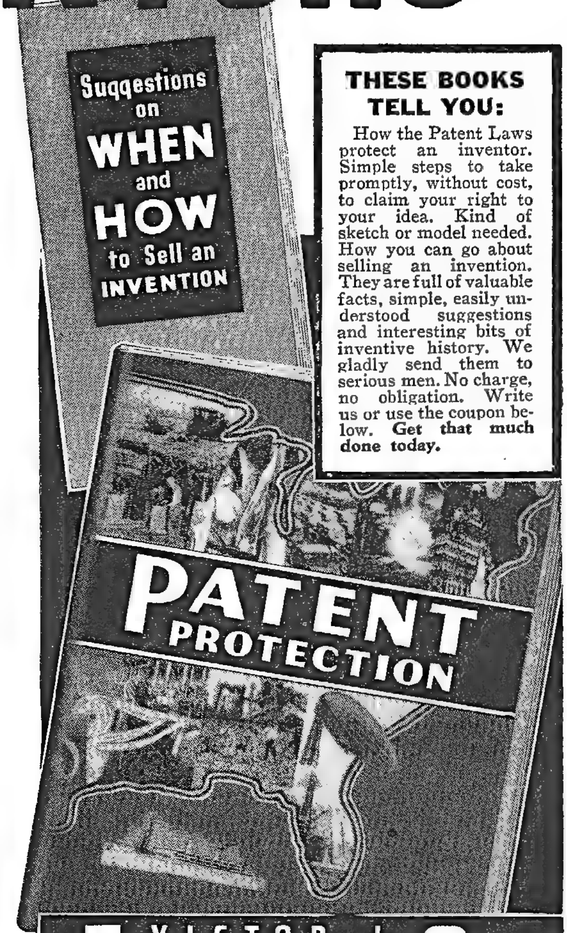
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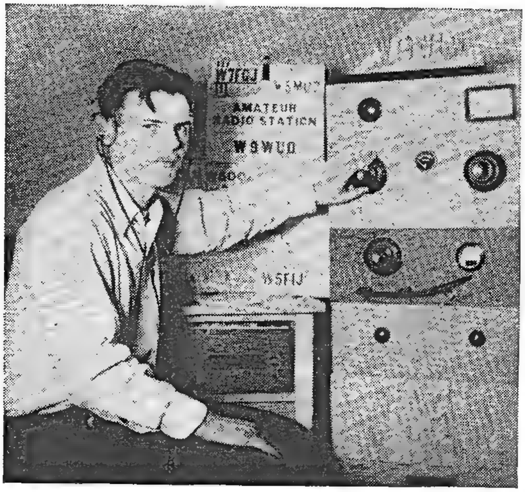
Editor's Workbench Chips

[*Continued from page* 10]



Paul Schuster poses in amateur radio station, W9WUQ, operated by his brother. Equipment was constructed from MI plans.

which appears on pages 88 and 89. It's an interesting how-to-build feature that will tell you how to make those fascinating boat-in-bottle decorations so dear to the hearts of yachtsmen.

***

Paul Schuster of Gilbert, Minn., "tuned in" for a $3 award when he sent in a photo of his brother's amateur radio station. According to Paul, his brother constructed the transmitter and receiver from plans that appeared in MI. The call letters of the station are W9WUQ in case any other MI amateur radio operators would like to contact Paul's brother and talk things over. By the way, how many of you Workbench readers ARE amateur radio operators or short-wave listeners. Why not send me a card telling of your radio interest?

James Jacobson in his home-built sailboat. MI plans were used.

***

Judging from reports, the past summer was a season of great activity for MI boat builders like James Jacobson of Oakland, Calif., who won a $3 award by sending in a photo of his "Little Bear" sailboat, which he built from MI plans. James made the cockpit smaller than indicated on the plans in order to eliminate shipping water in a rough sea. Numerous tests on a nearby lake have proved the boat to be speedy and well balanced, so evidently Jim has done a first class job. Happy sailing, Jim.

One of the nicest looking small trailers I have seen for quite some time is that shown in the photo sent in by Monte La Flecke, also from Oakland, Calif. The trailer is a cross between the sportsman and house types, sleeps two and can be pulled along safely at any speed up to 50 m.p.h. The body is 11 feet, 6 inches long and 5 feet wide, being made of special composition materials. Monte claims he used only hand tools for the job and that it is his first project. Well done, Monte, so I'm sending you a $3 award.

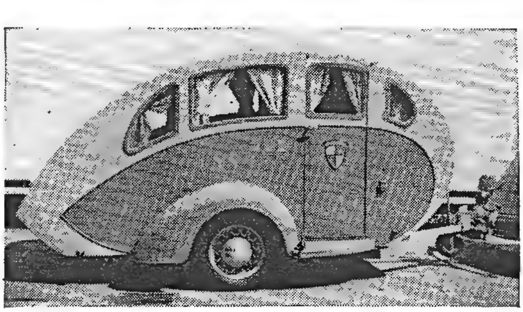
***

"Practice what you preach" has long been an MI policy, as far as both contributors and editors are concerned.

We never accept how-to-build articles unless we are certain that the projects themselves are practical and have actually been made and tested as described. No matter how attractive an idea looks on paper, in the form of drawings, we insist on having photographs at least of the completed job; and if the project is a bit complicated we also demand step-by-step construction pictures, even if the contributor has to tear down his model and start all over again. That this policy is a wise one is indicated by the steady stream of enthusiastic letters from readers all over the world who follow MI plans with unfaltering success.

As for ourselves—well, we immodestly think we're a pretty practical, versatile and hard-boiled quartet of editors. Our aviation man has been a licensed pilot for six years, and when he isn't flirting with the clouds on week ends he hunts, fishes, and makes model planes. Our radio editor has been a licensed transmitting amateur for a dozen years, and he relaxes on Sundays by boating on Long Island Sound. Our photography editor is so busy handling the MI photography department—the largest and

[*Continued on page* 14]



Using only hand tools, Monte La Flecke built this sportsman-type trailer. It is 11¾ feet long and sleeps two comfortably.

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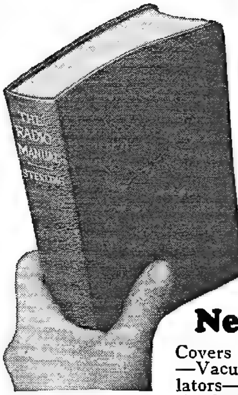

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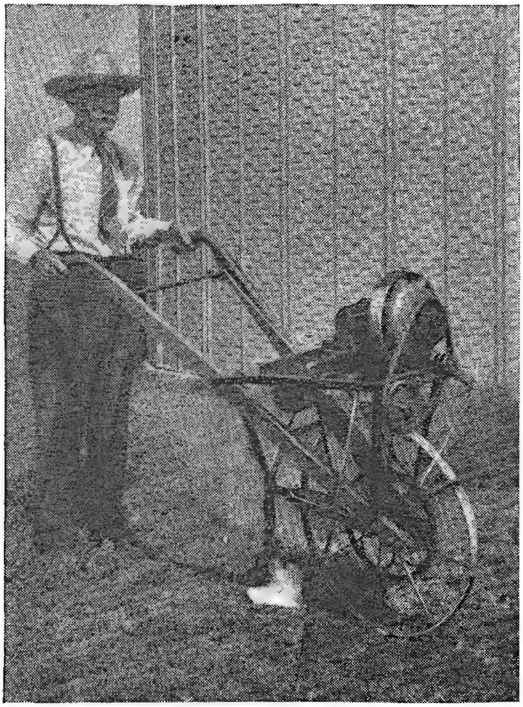
Editor's Workbench Chips

[*Continued from page* 12]

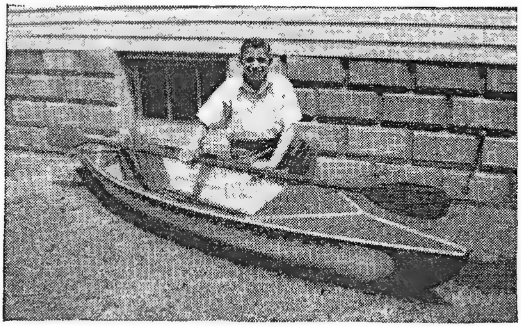


Powered by a washing machine motor geared to its wheel by a sprocket chain, this cultivator was built by Marion Long.

most widely recognized department of its kind—that he doesn't have time for much else. Our workshop expert, believe it or not, has a pretty complete cellar shop, with lathe, circular saw, drill press, etc., and he also dabbles in radio and photography. Next month maybe we'll run some pictures of ourselves—taken, of course, by the camera editor.

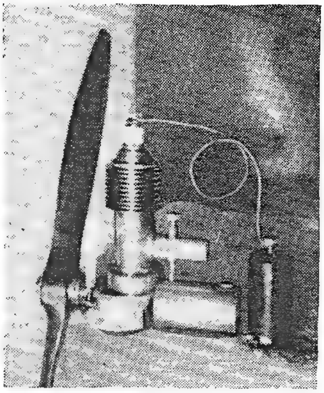
***

Another novel use for old washing machine motors has been developed by Marion R. Long of Newcastle, Ind., who sent in the photo at left. Marion built a garden cultivator, driving its one wheel by means of a sprocket chain geared to a three-quarter horsepower utility motor. Marion's Dad is shown piloting the home-built cultivator, so maybe I should advise him to "cut in" on the $3 award I'm sending. How about it, Marion?



Taking advantage of local school workshop facilities, Albert Kuzma constructed this 10½-foot kyack from his own plans.

***



Powerful enough to fly an 8-foot model airplane, this 4½-inch "gas" engine was built by Carl Johnk.

Another MI fan who has succumbed to the kyack craze is Albert Kuzma of Gary, Ind. Albert built his kyack in the local school workshop from his own plans. It is 10½ feet long, 27 inches wide and 10 inches deep. I'll bet the other boys in school are envious of Al and they'll be doubly so when they learn that he won a $3 MI prize.

***

I'm pleased to award a well-earned $3 to Carl Johnk of Alton, Ill., who built a miniature gasoline motor for model airplanes. The motor was built entirely from scrap metal and stands 4½ inches high. The bore and stroke are both seven-eighths of an inch. Nice work, Carl. How about a photo of your eight-foot gas model airplane?

***

NOTICE TO WORKBENCH FANS

Send in photos of your completed workshop projects. Each month MI awards a first prize of $5 for the best photo and letter received by this department and prizes of $3 each for all other photos and letters used. Mail your photo and letter *today!*

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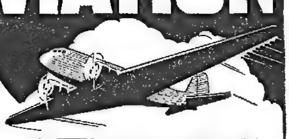

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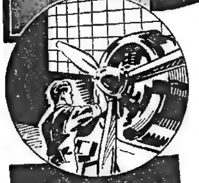

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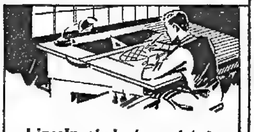

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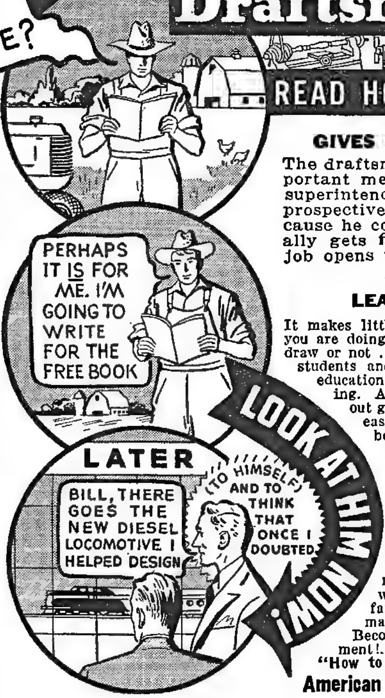
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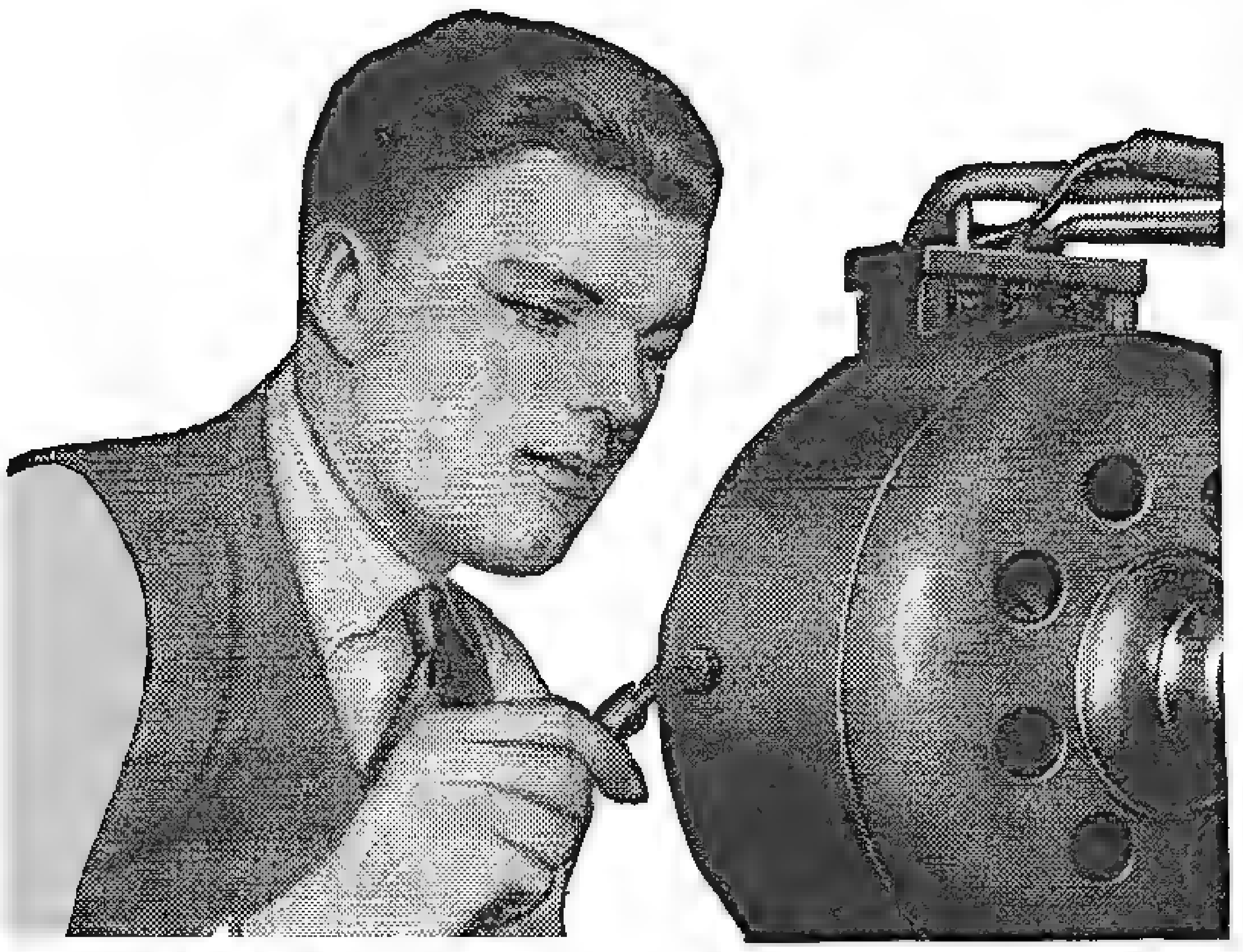

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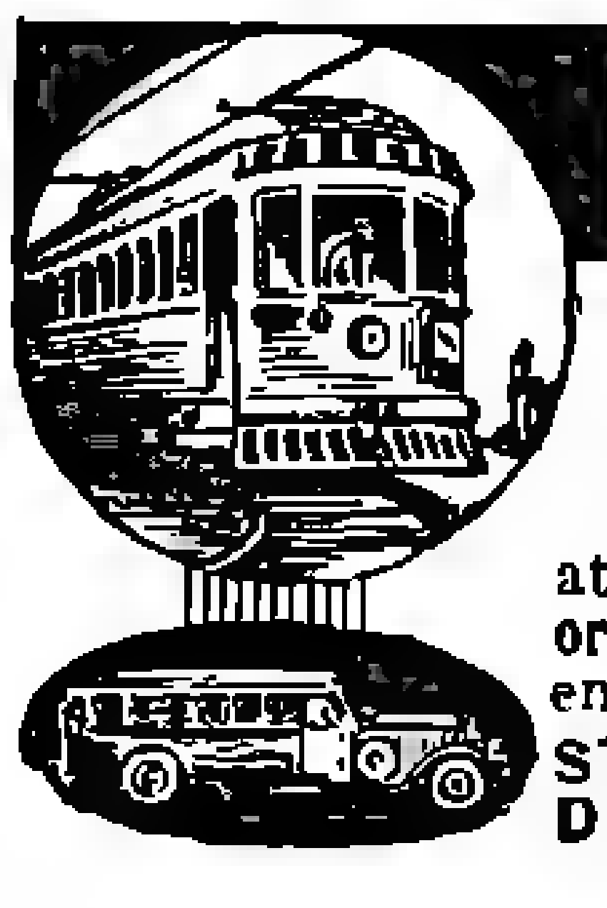

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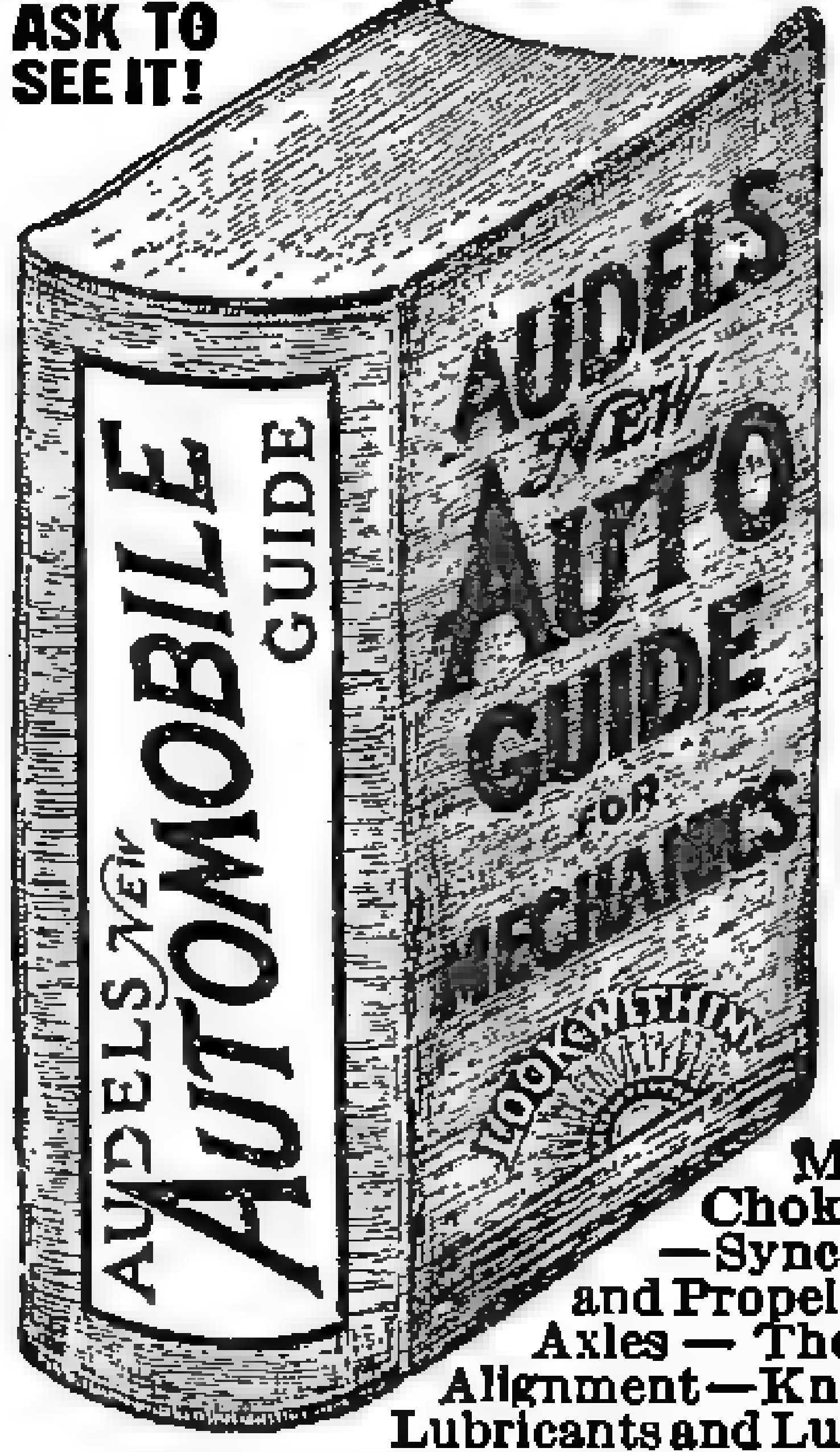

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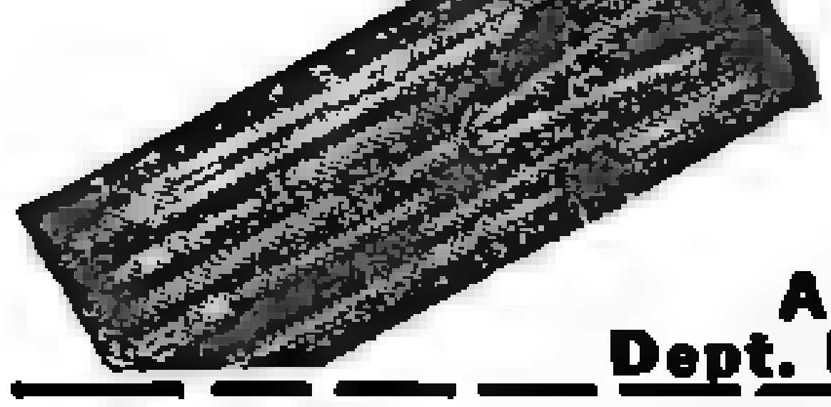

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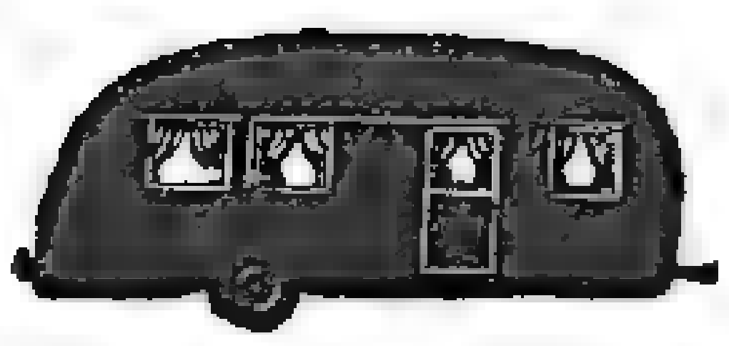

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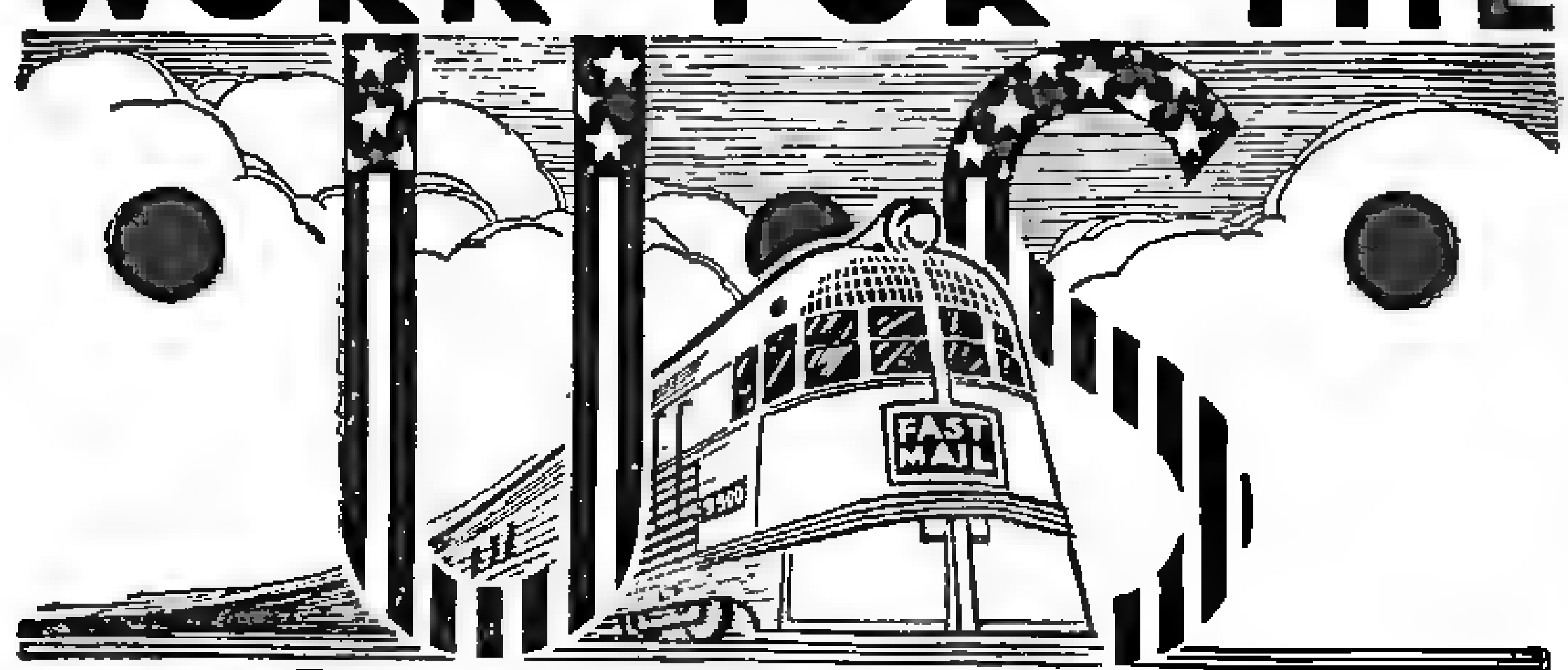

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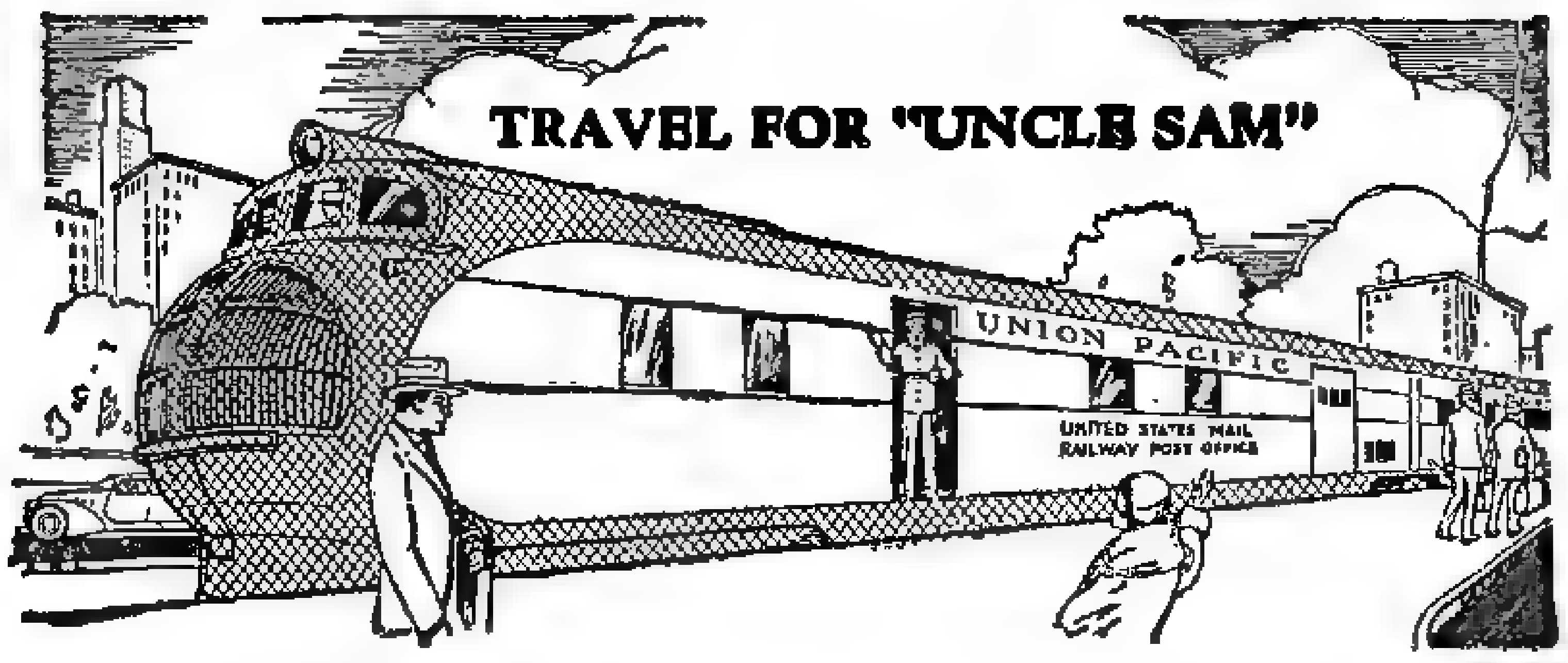
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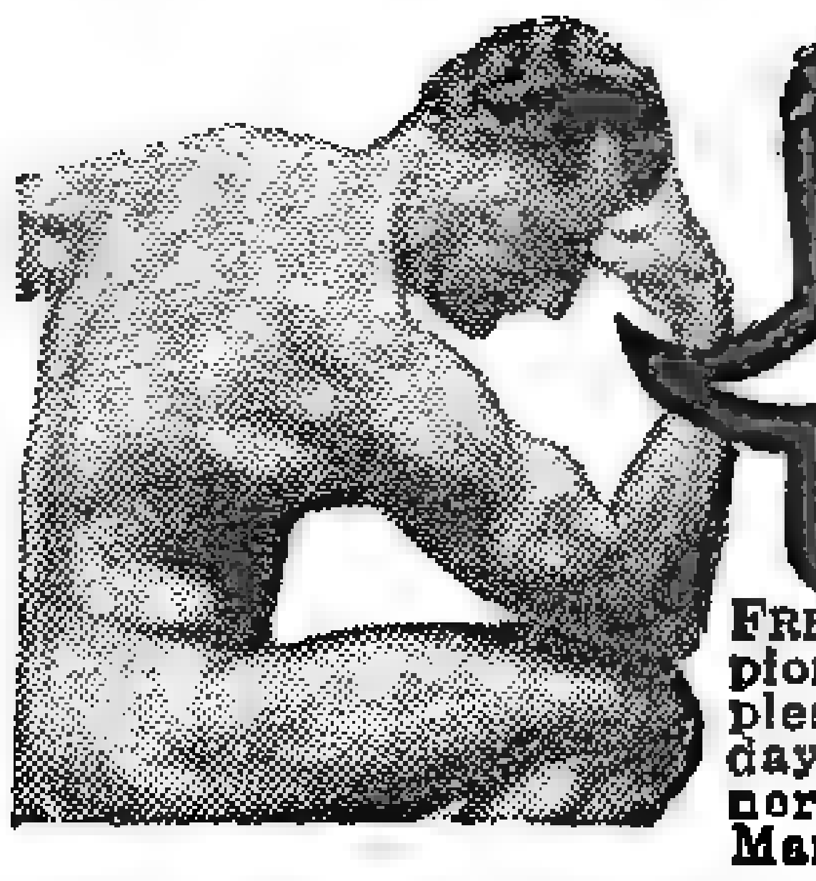

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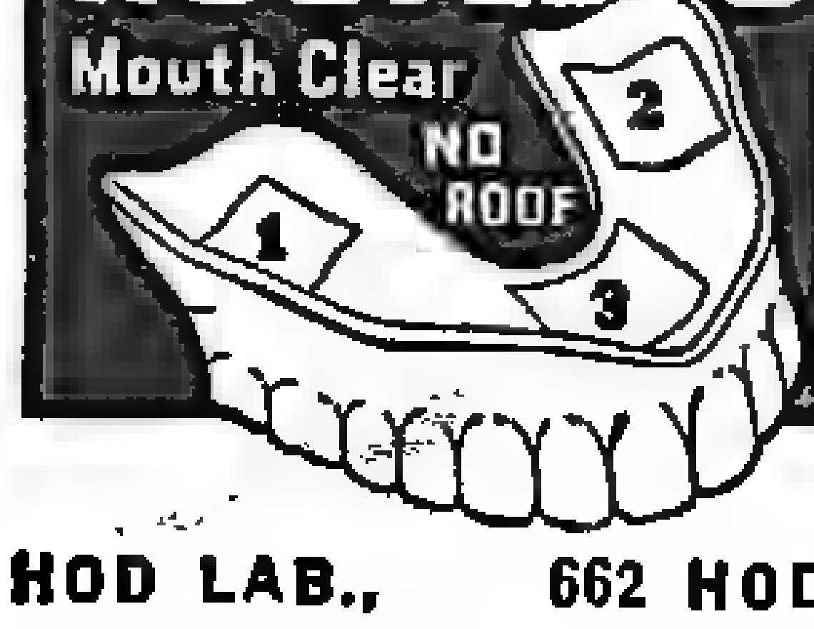

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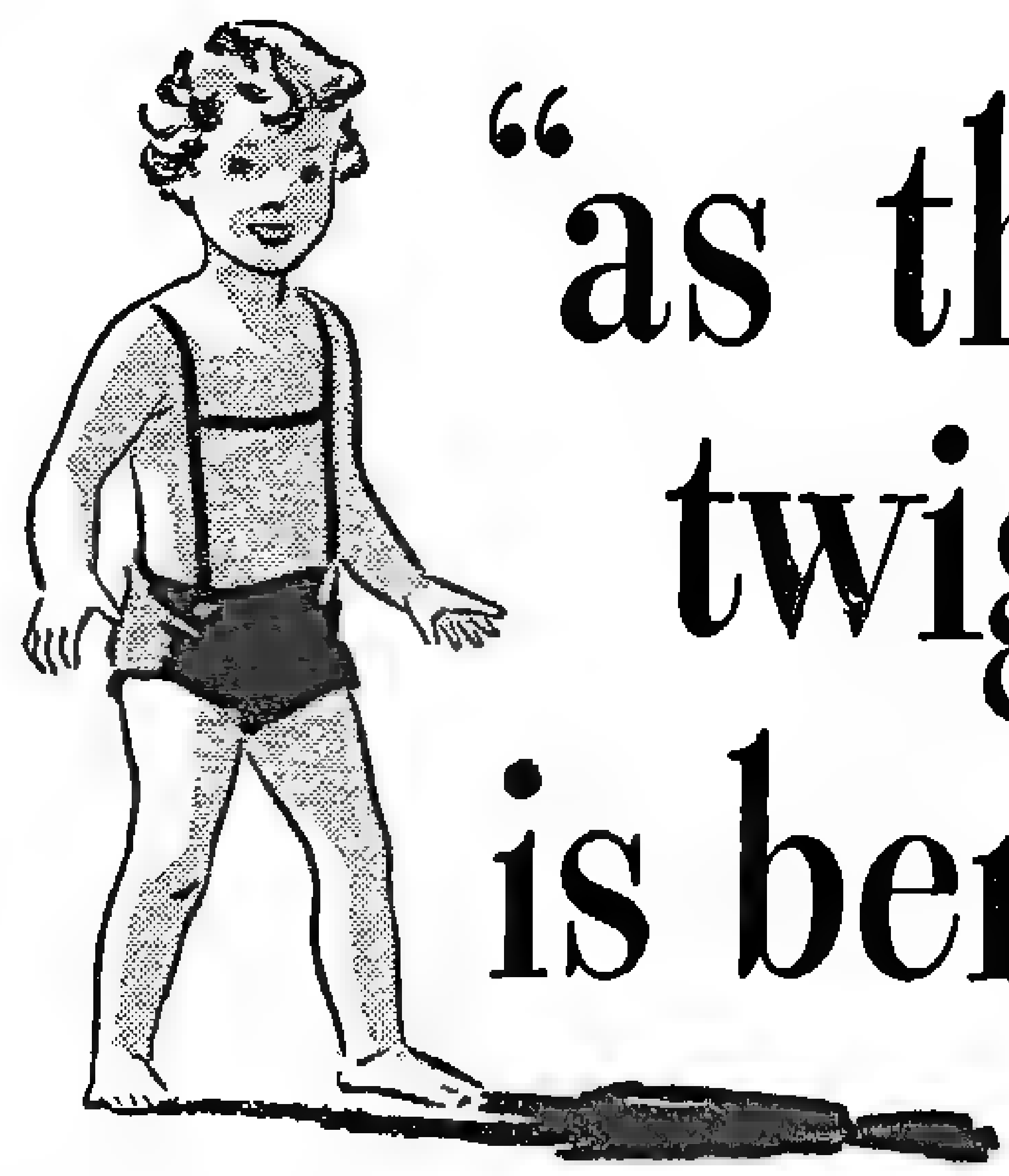

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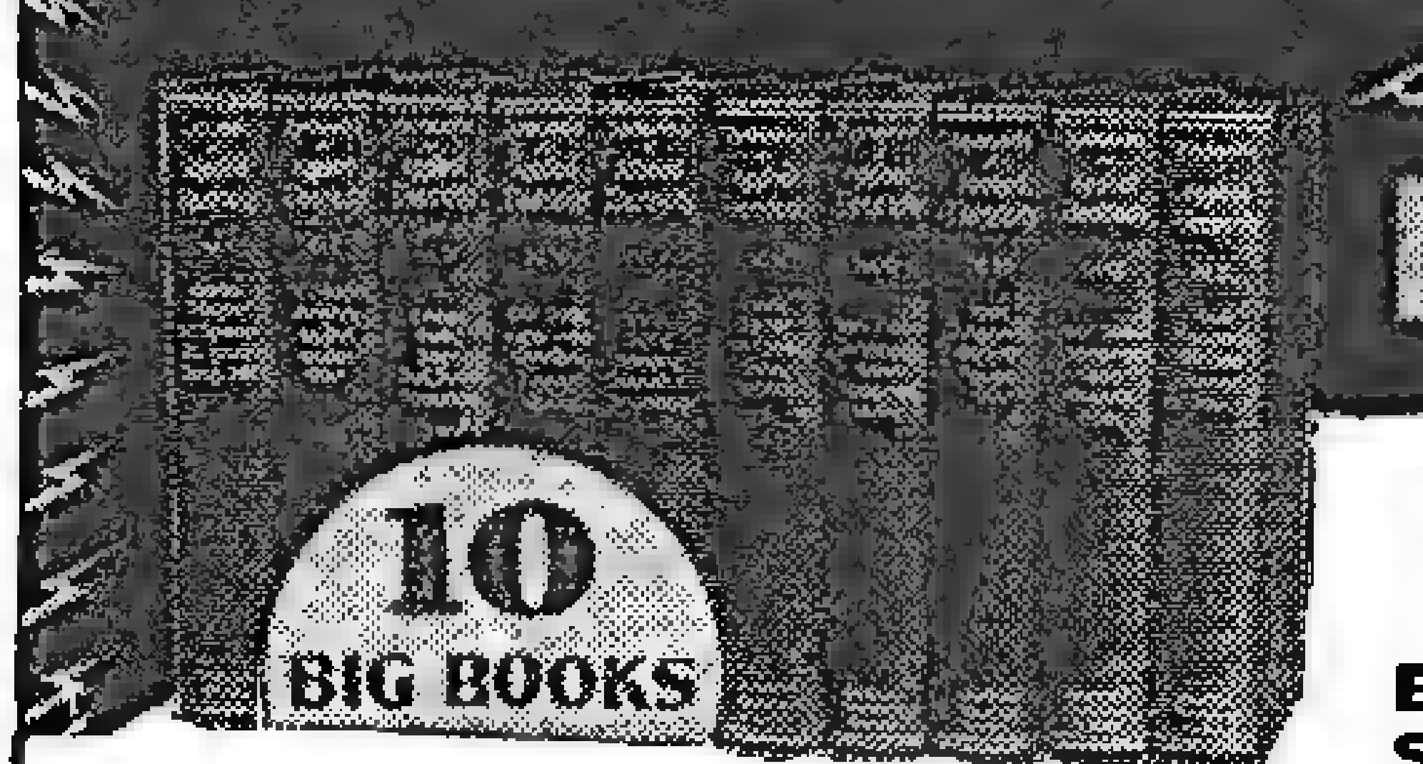

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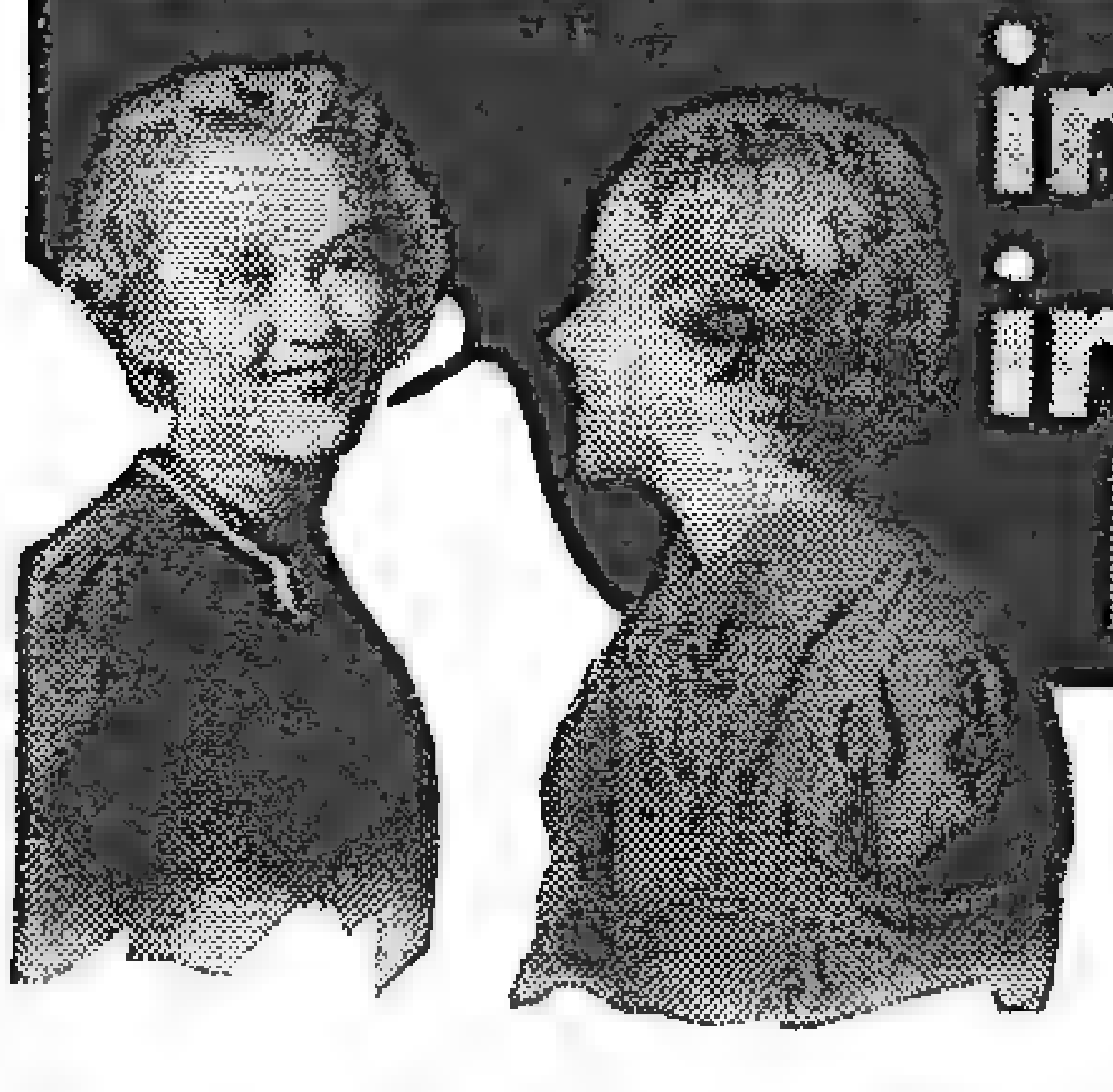

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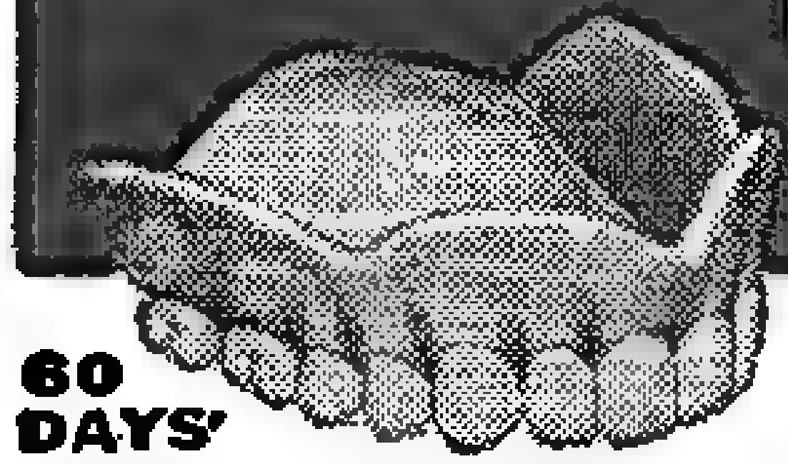

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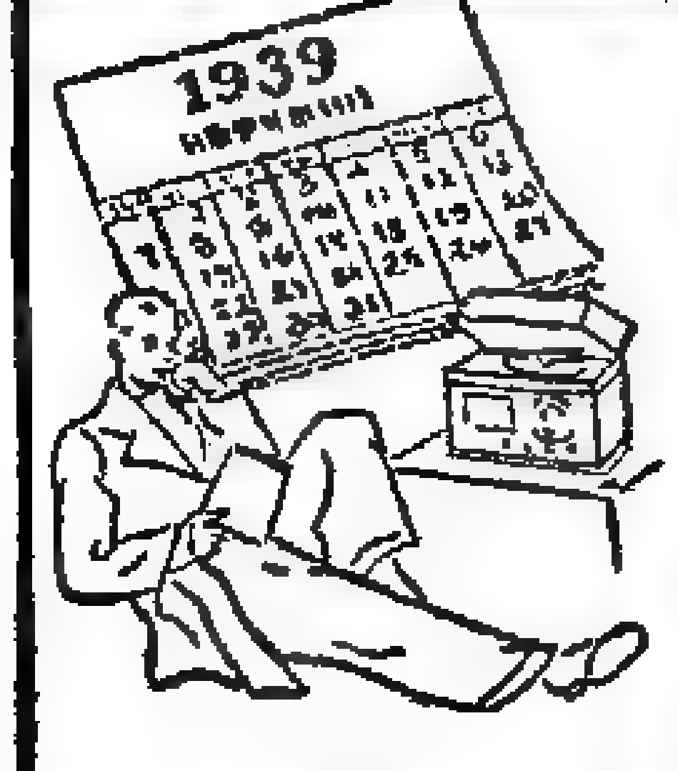

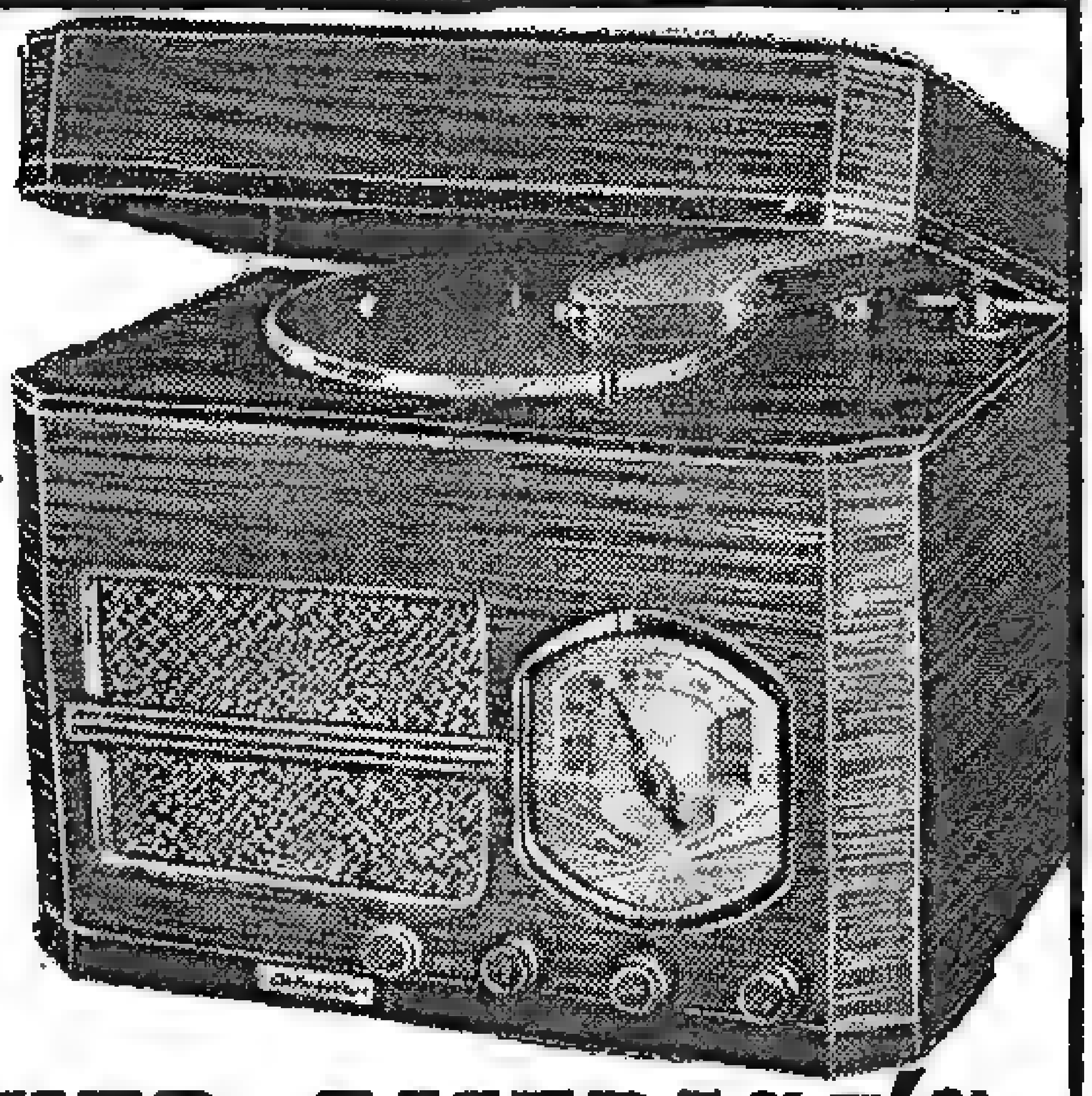

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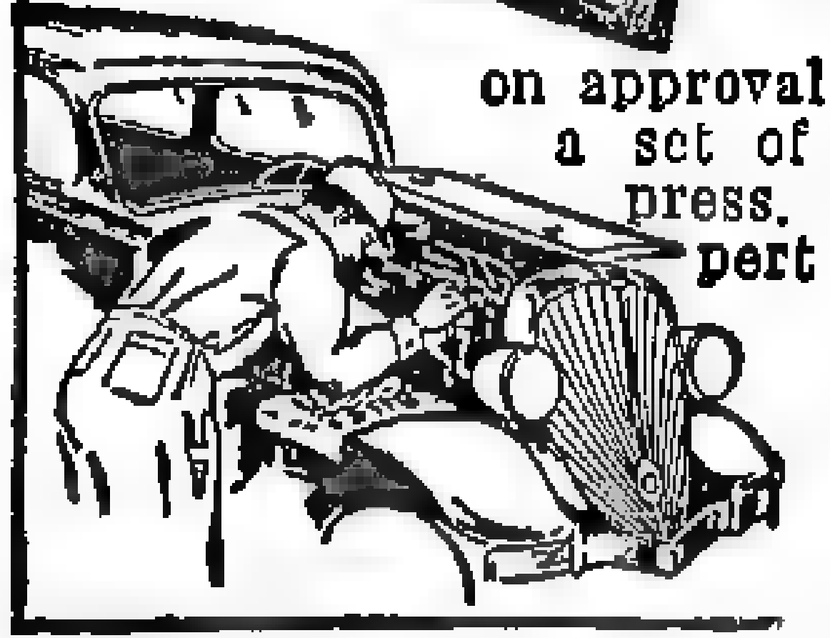

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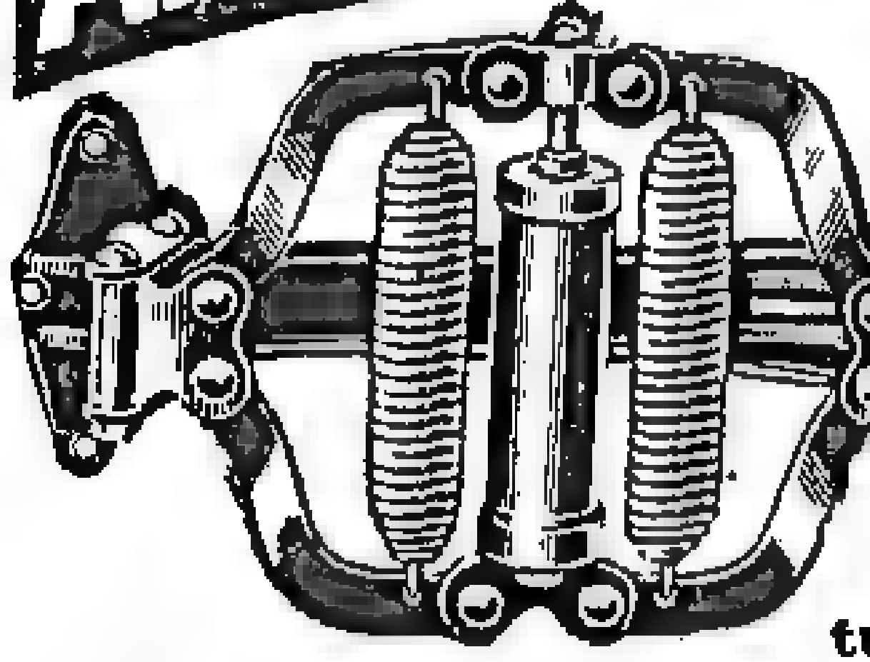

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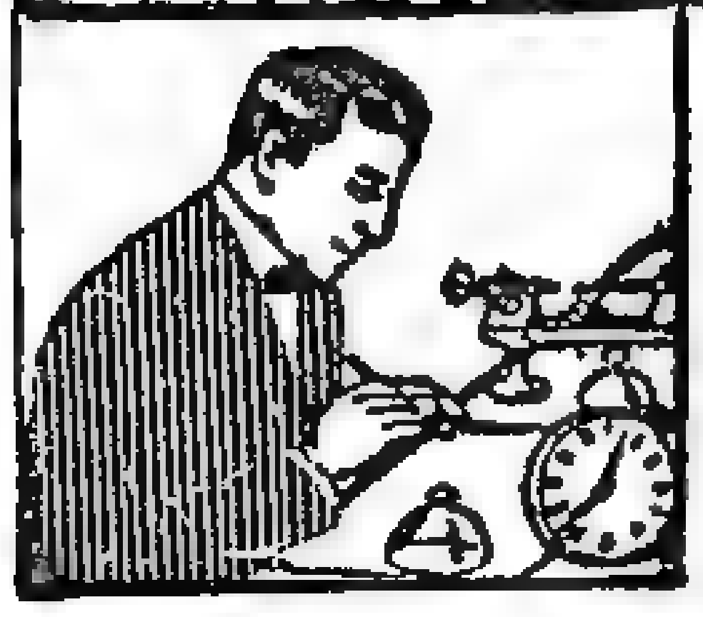

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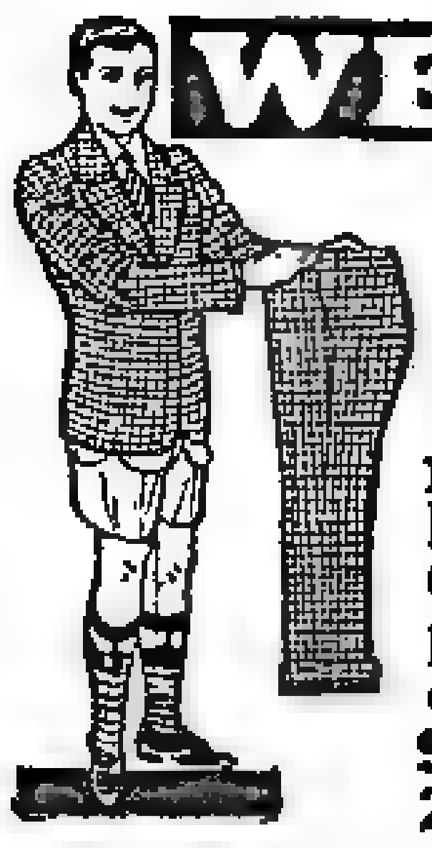

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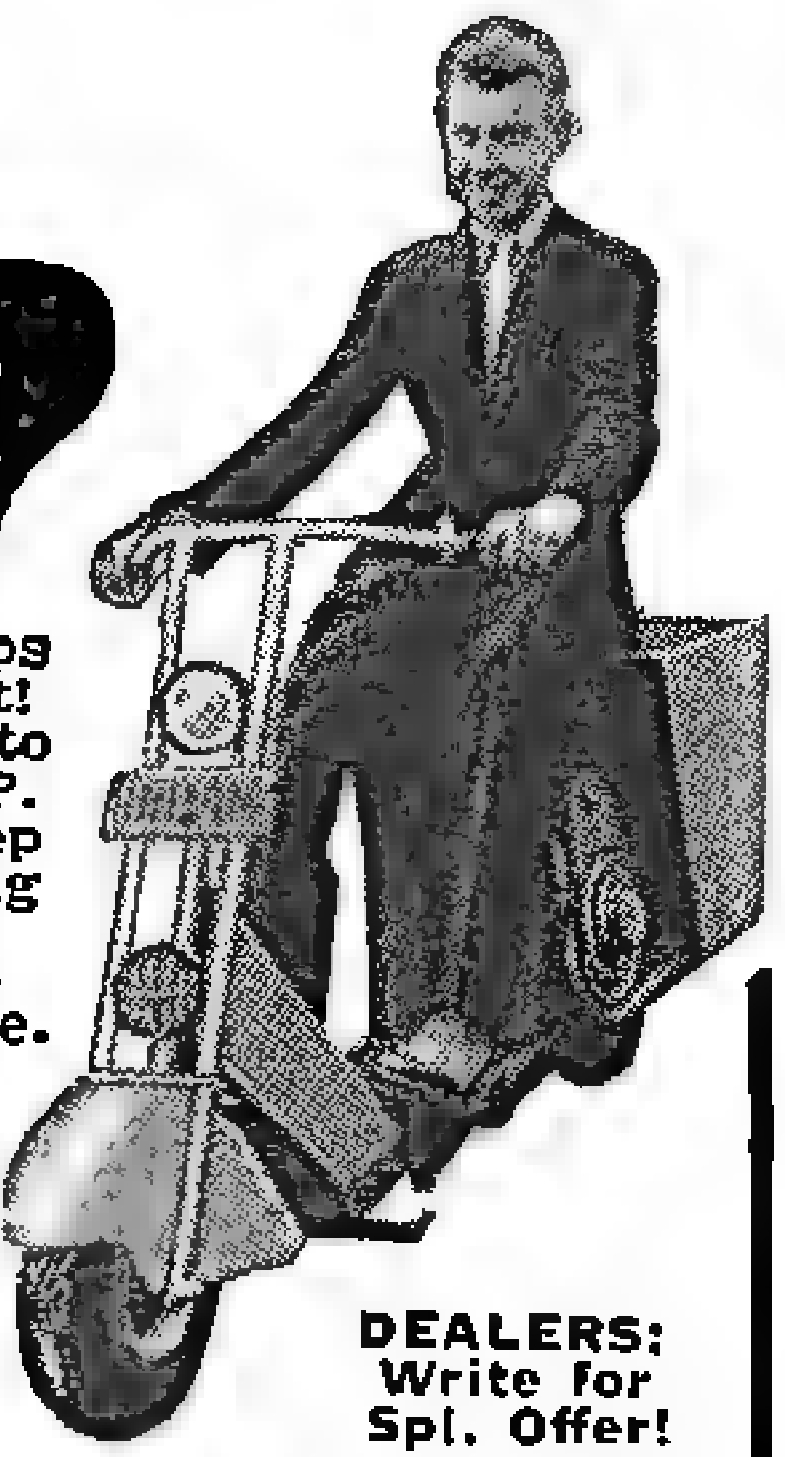

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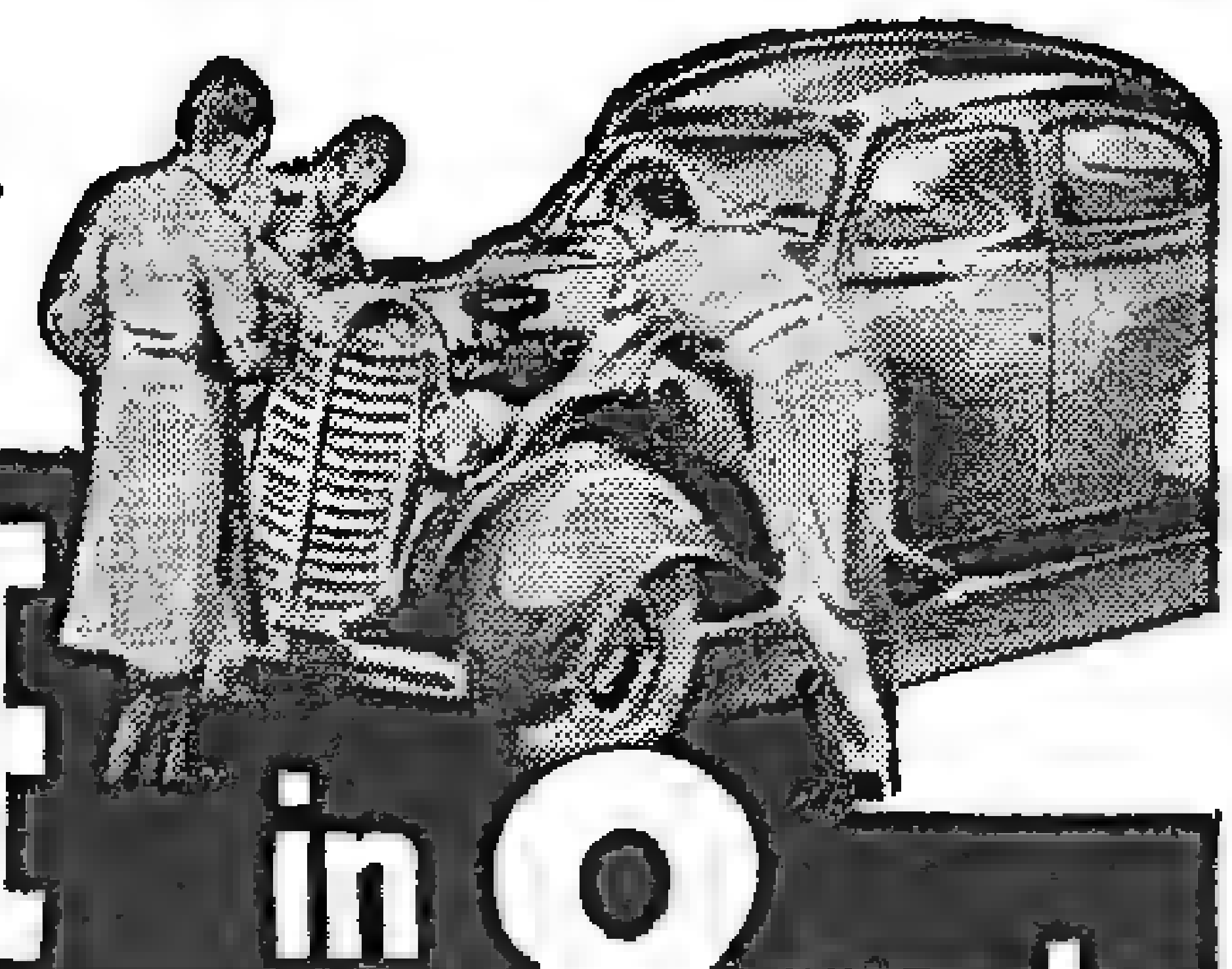

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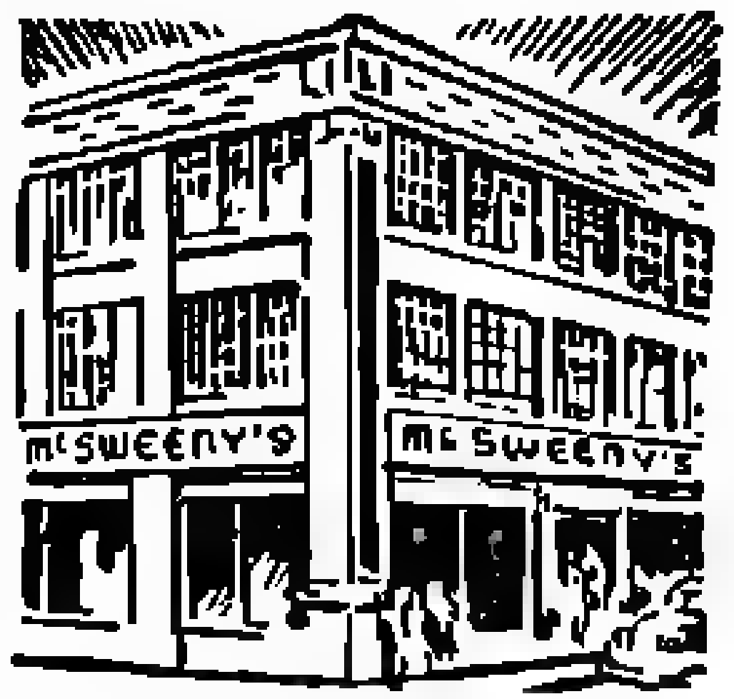

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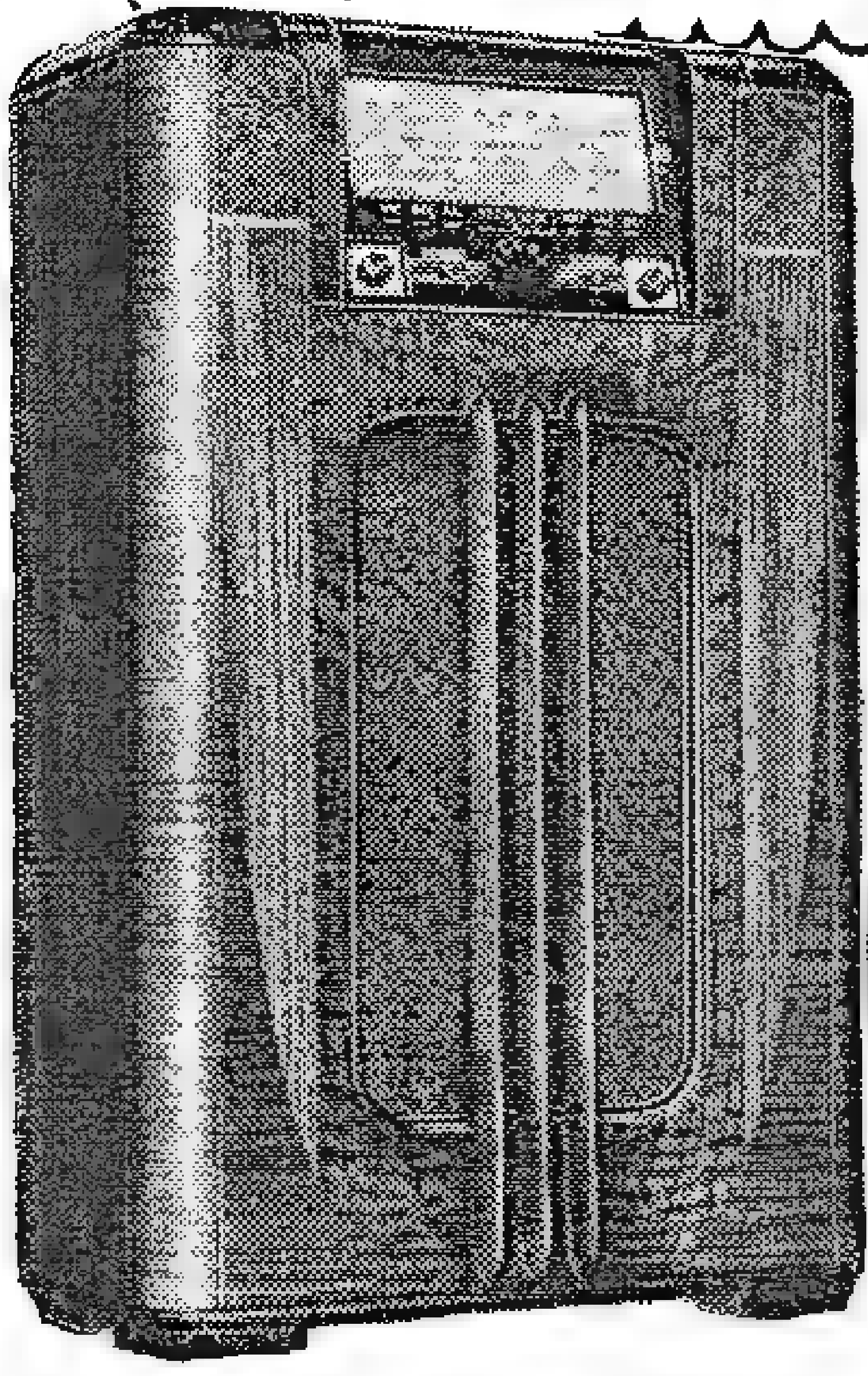

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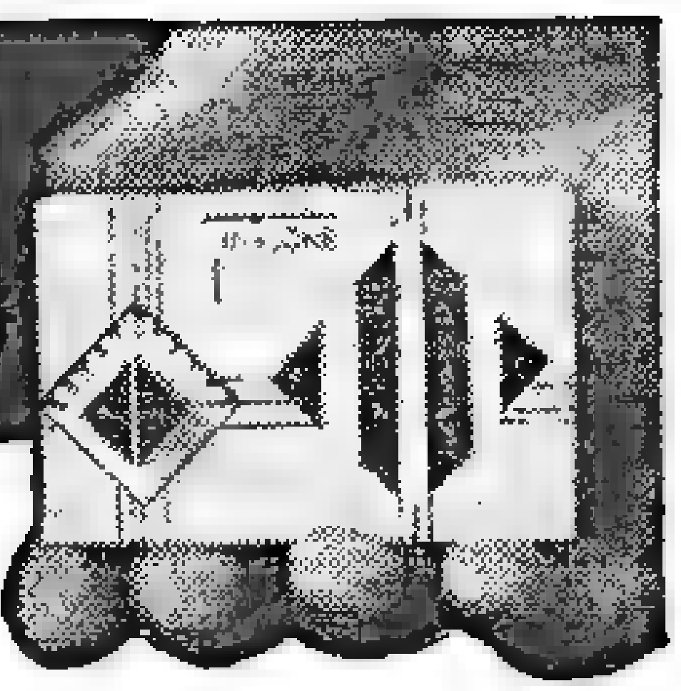

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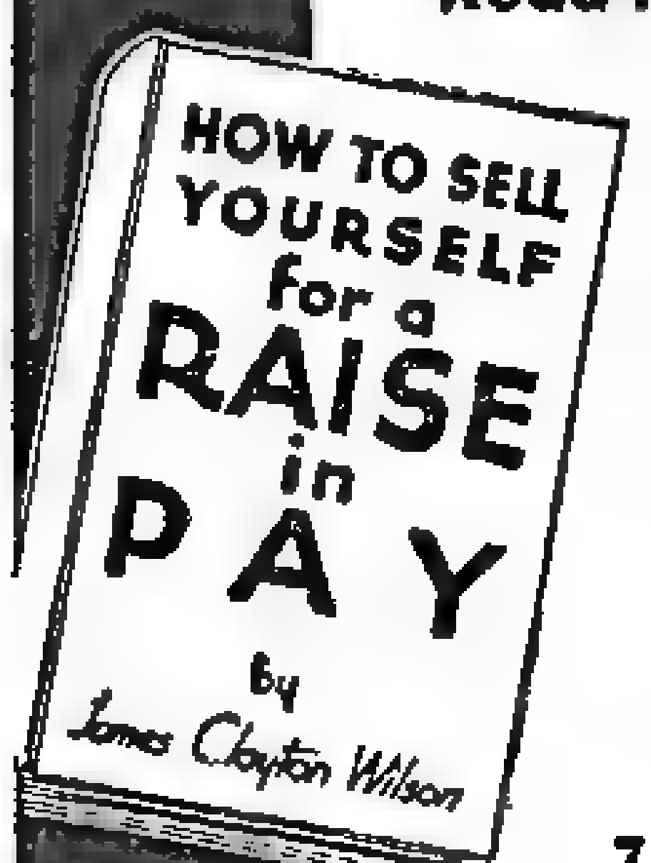
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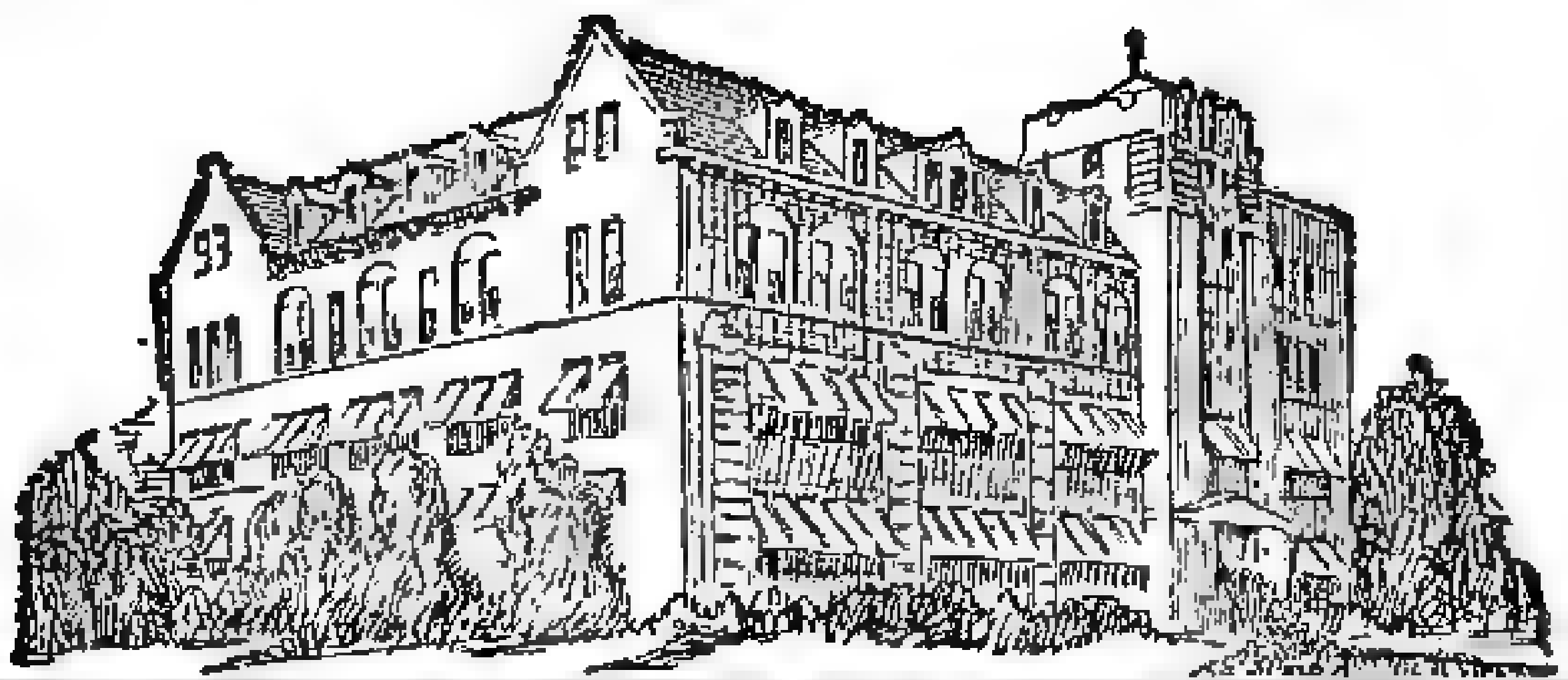

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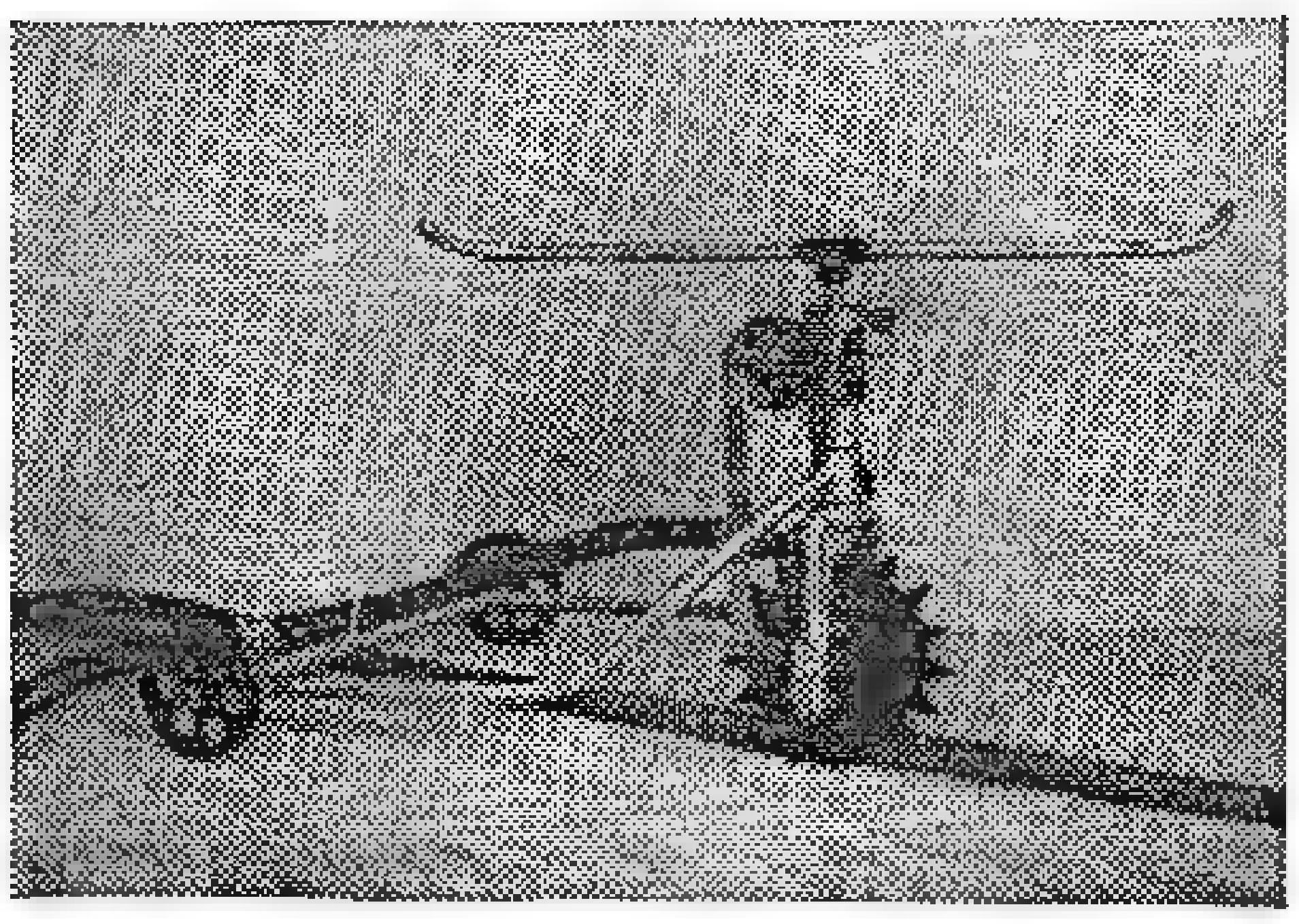

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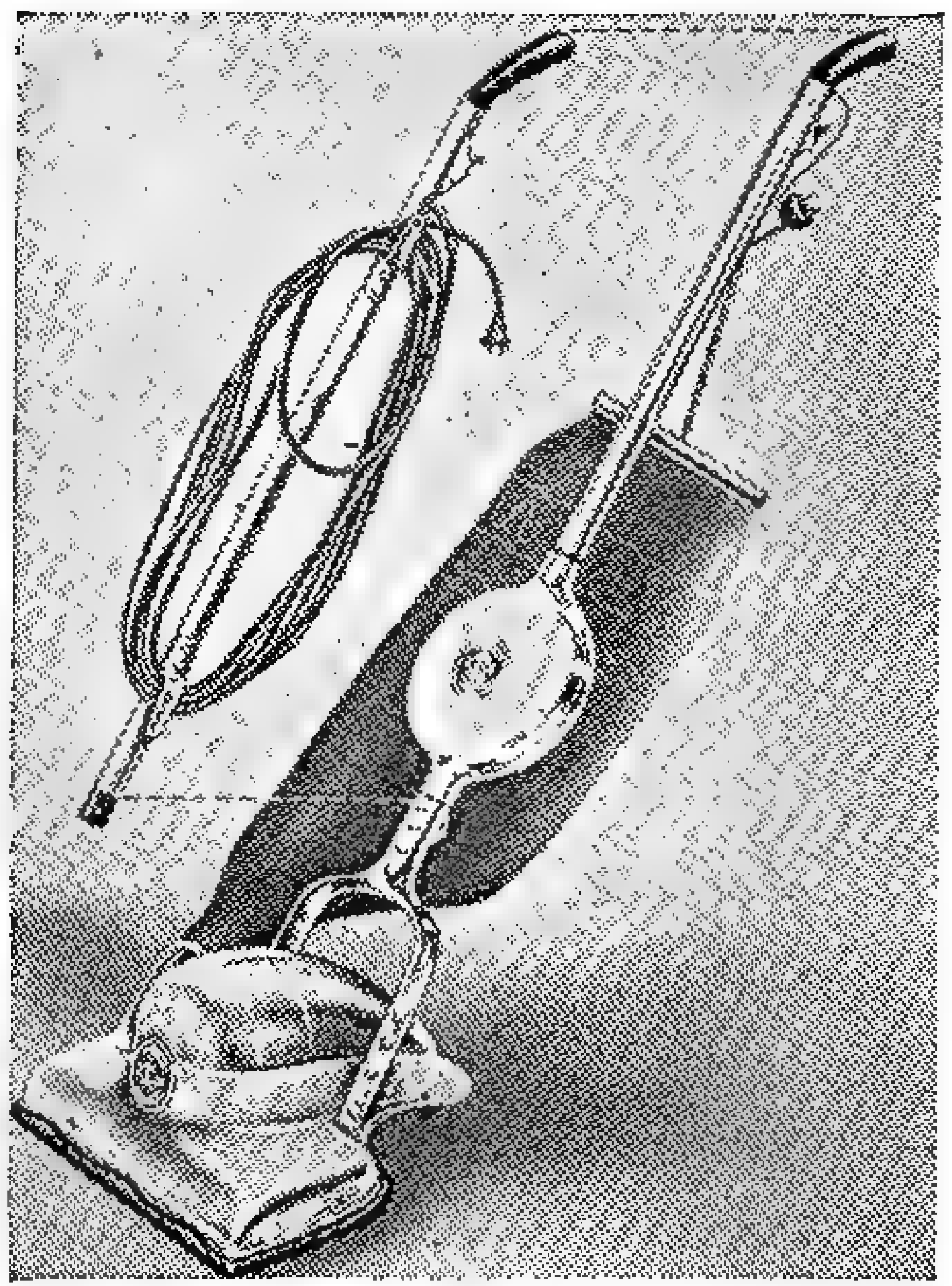

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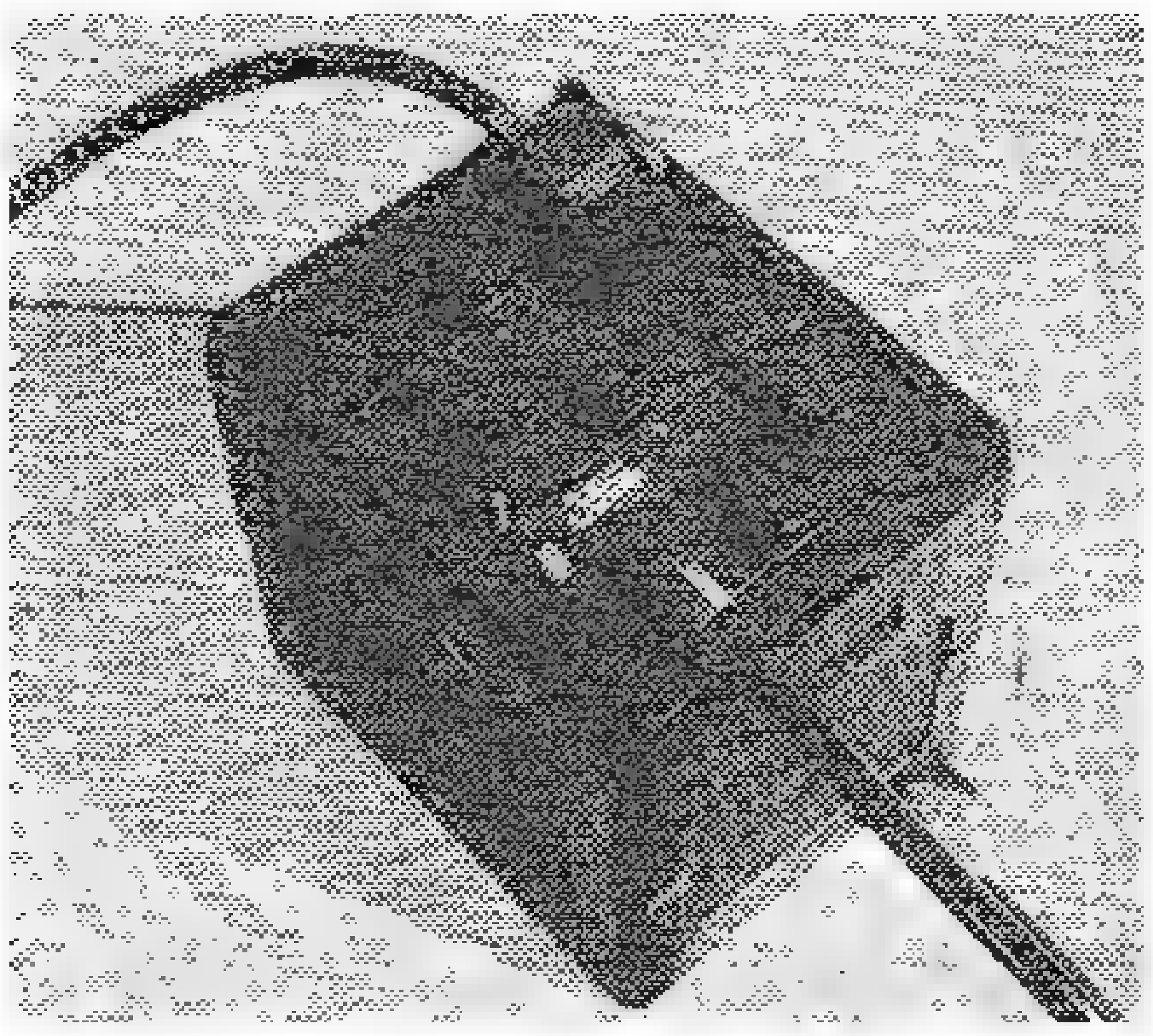

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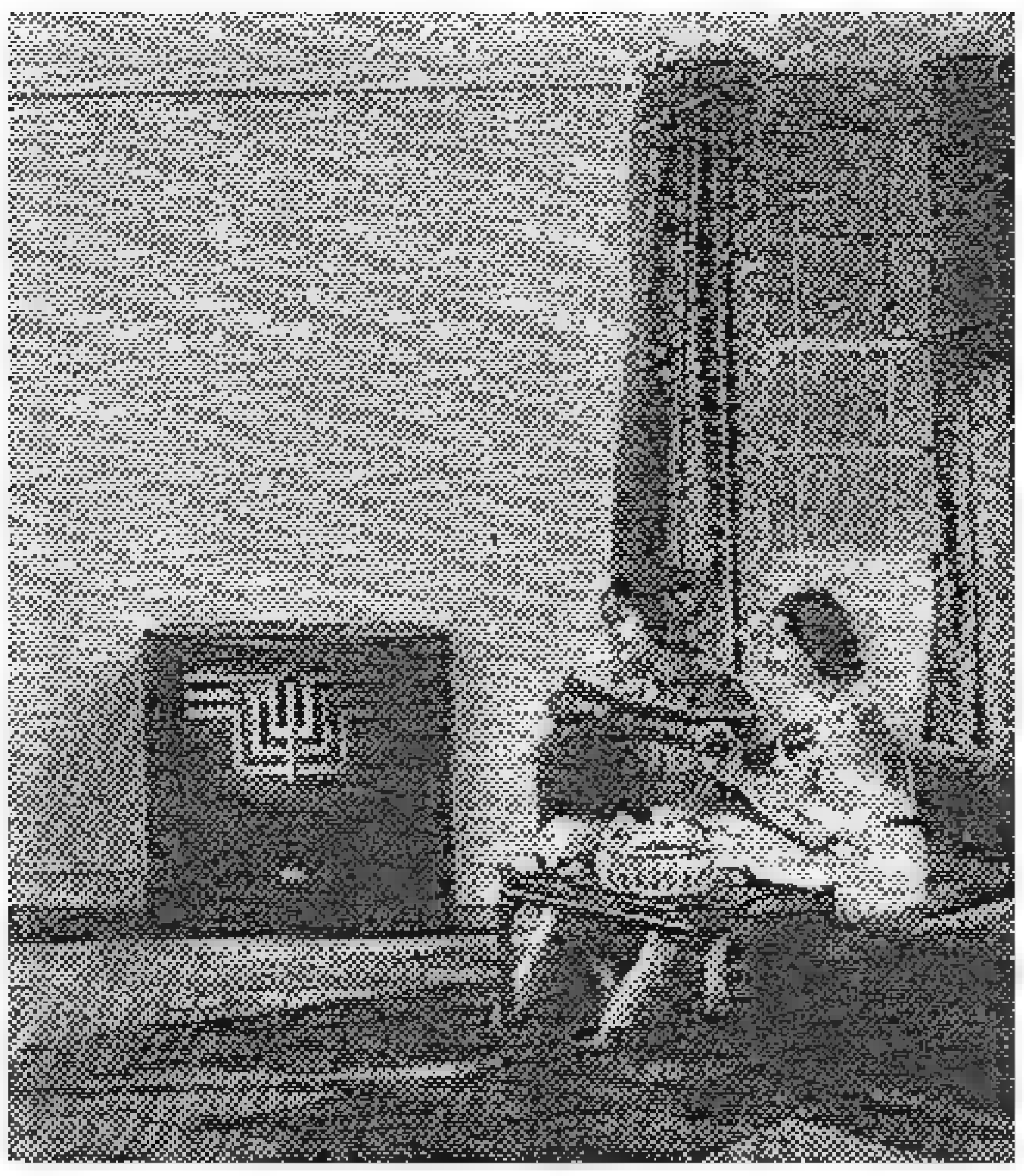

This new type oil-burning space heater offers new standards of heating performance. Its lower design, greater heat output area, special directional heat guides and higher efficiency are said to result in warmer floors and less wasted heat at the ceiling.

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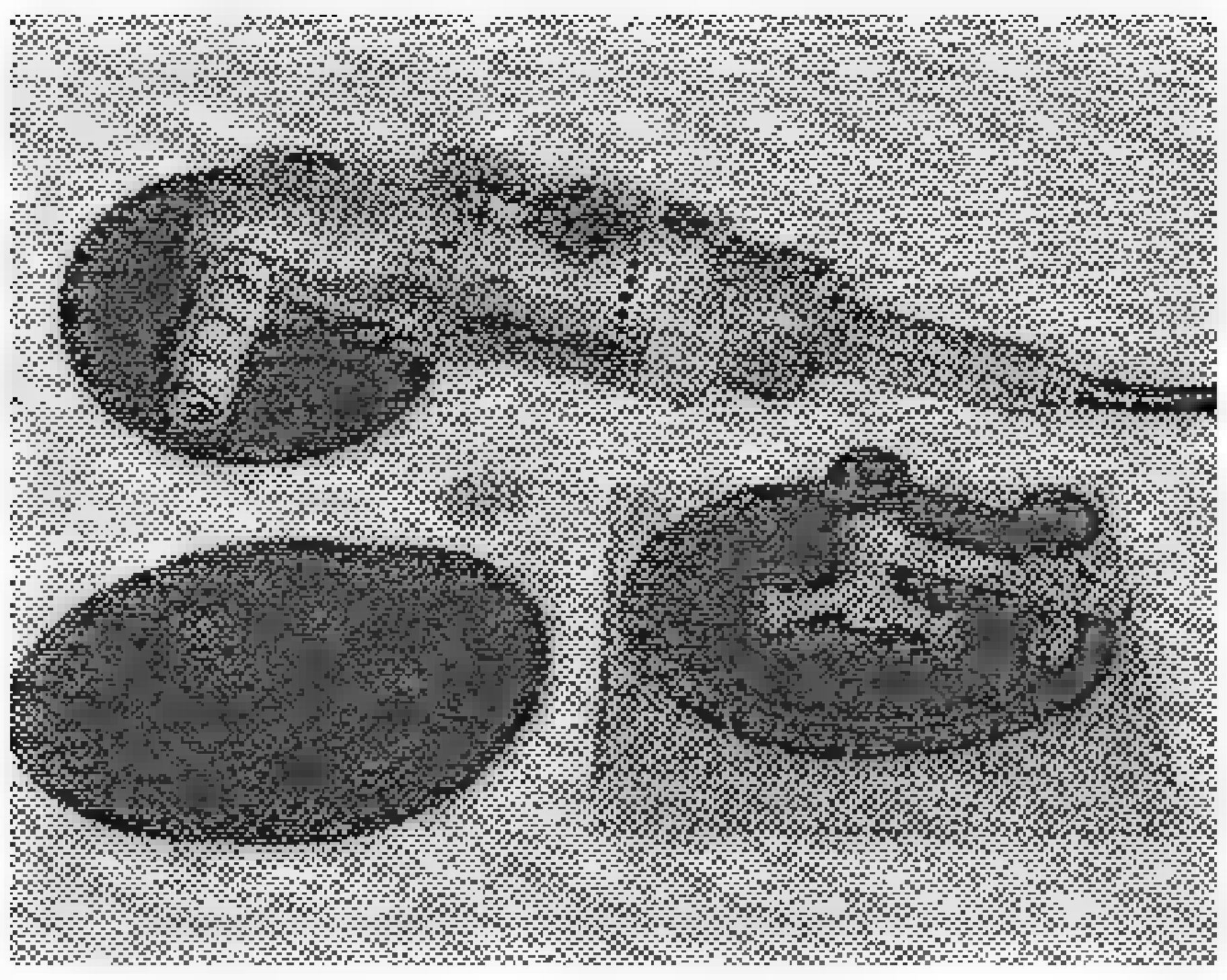

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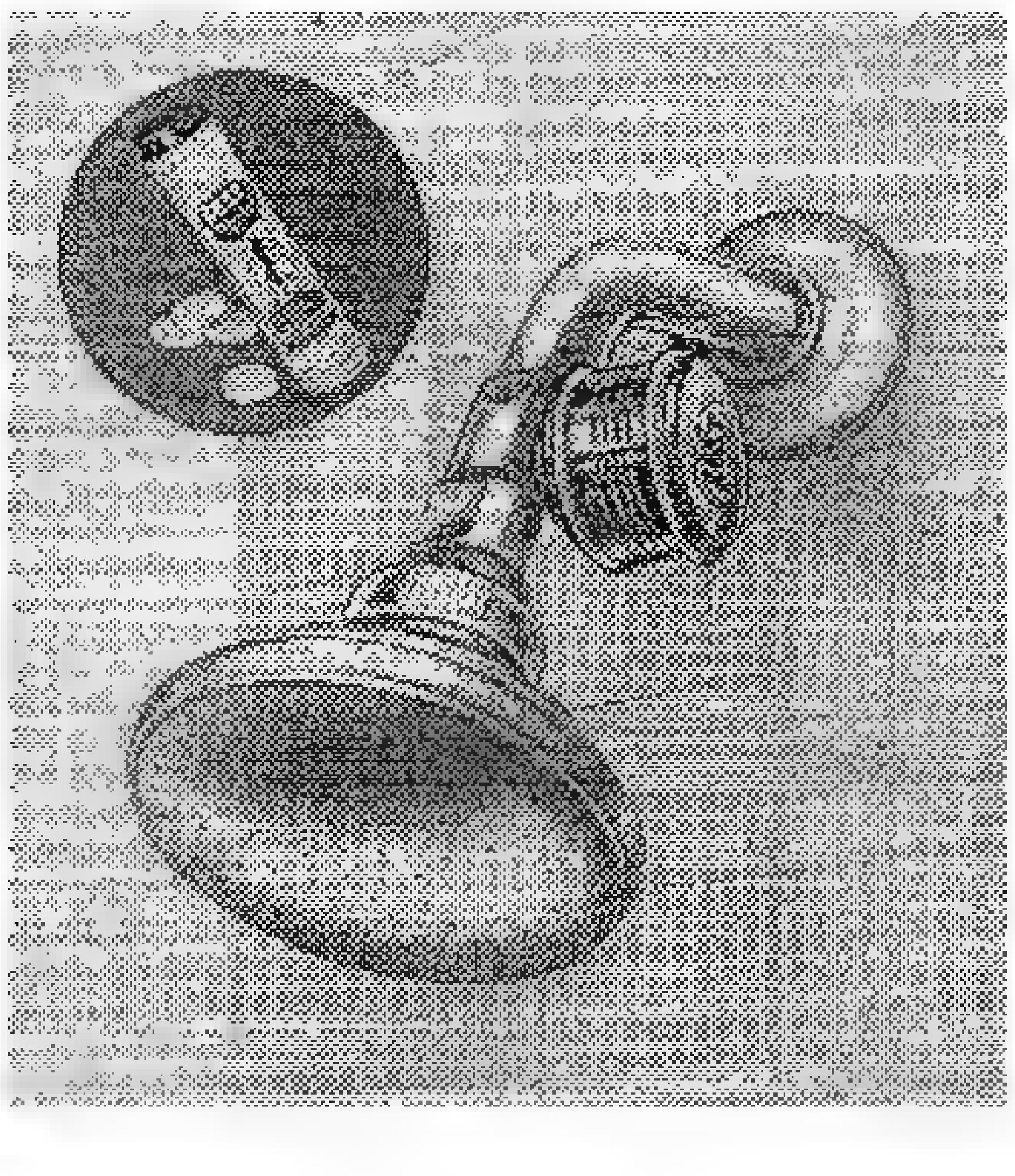

A small tablet placed in the receptacle of this shower attachment supplies softened and perfumed water. To attach to any shower, remove shower head, screw the fitting on shower arm or pipe, and replace shower head.

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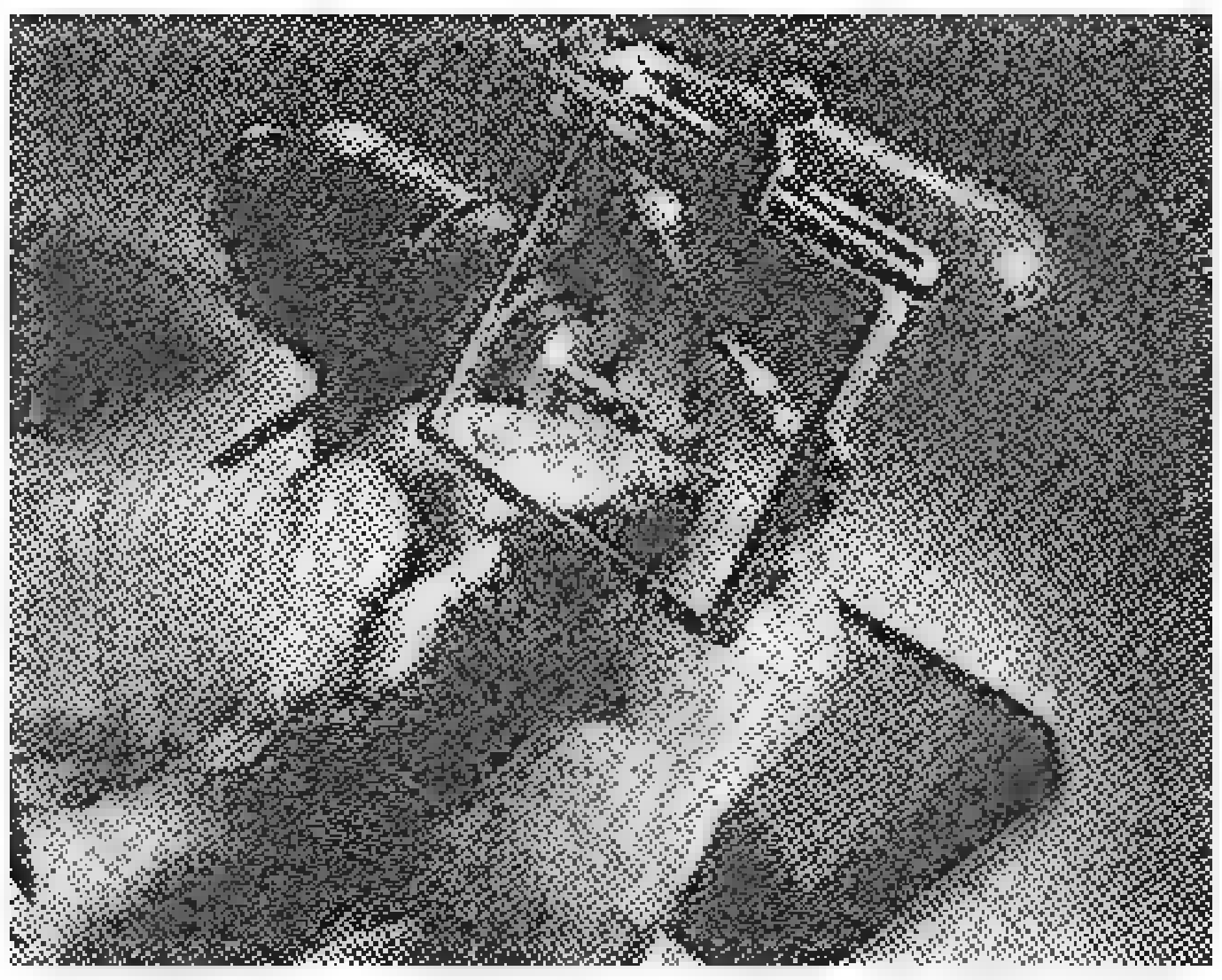

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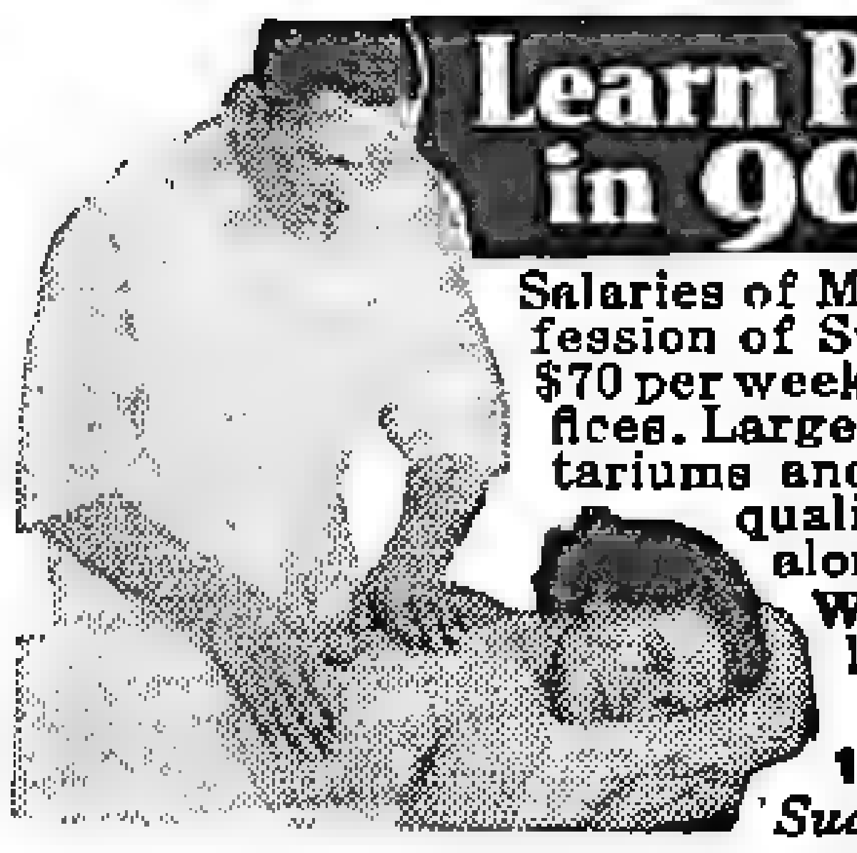

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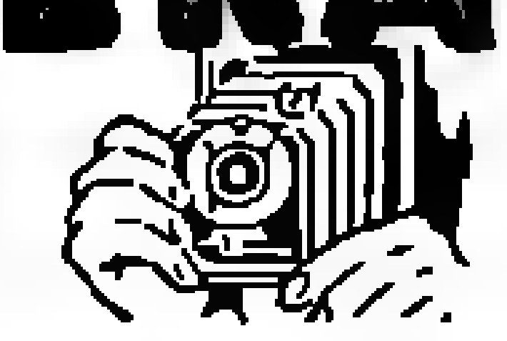

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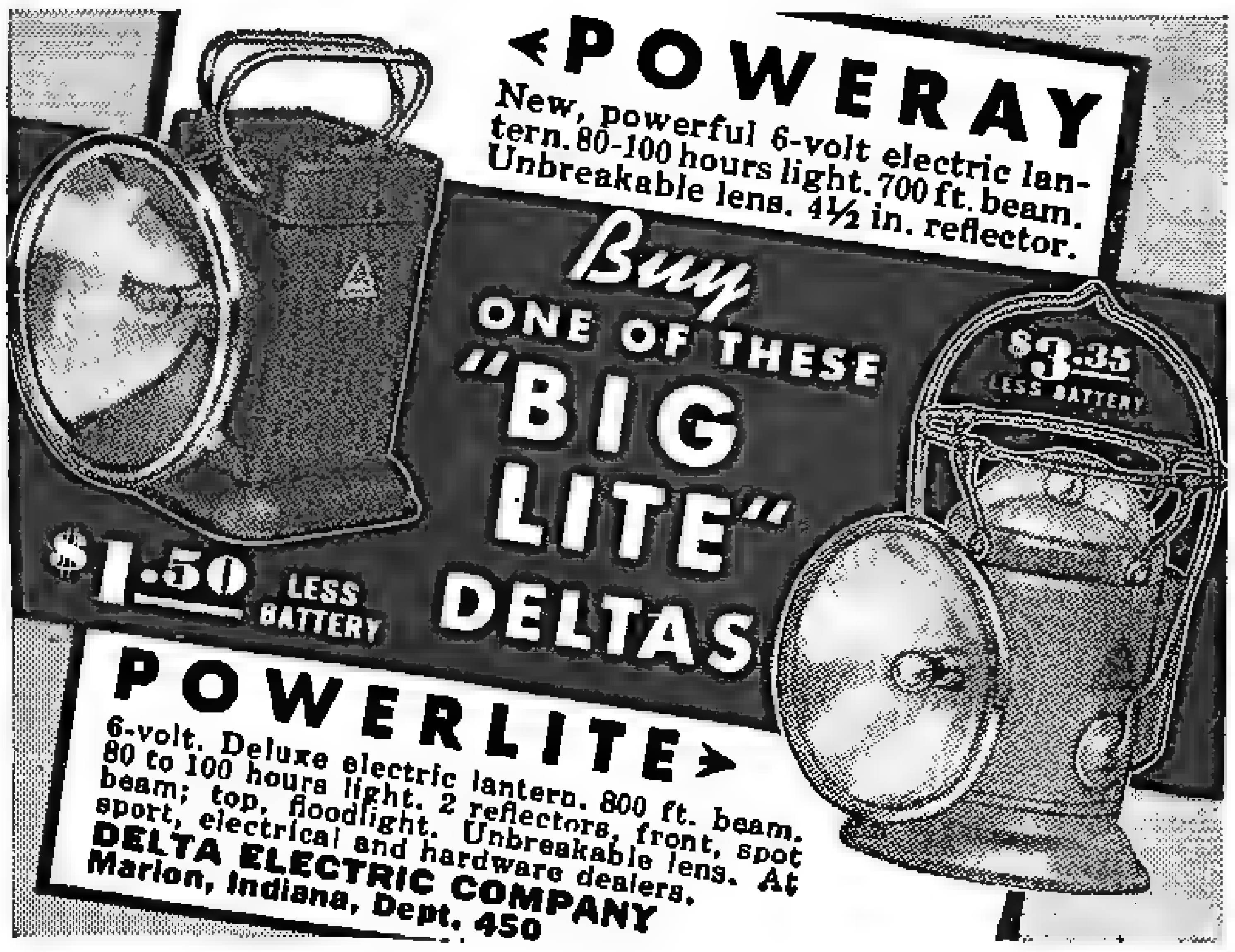

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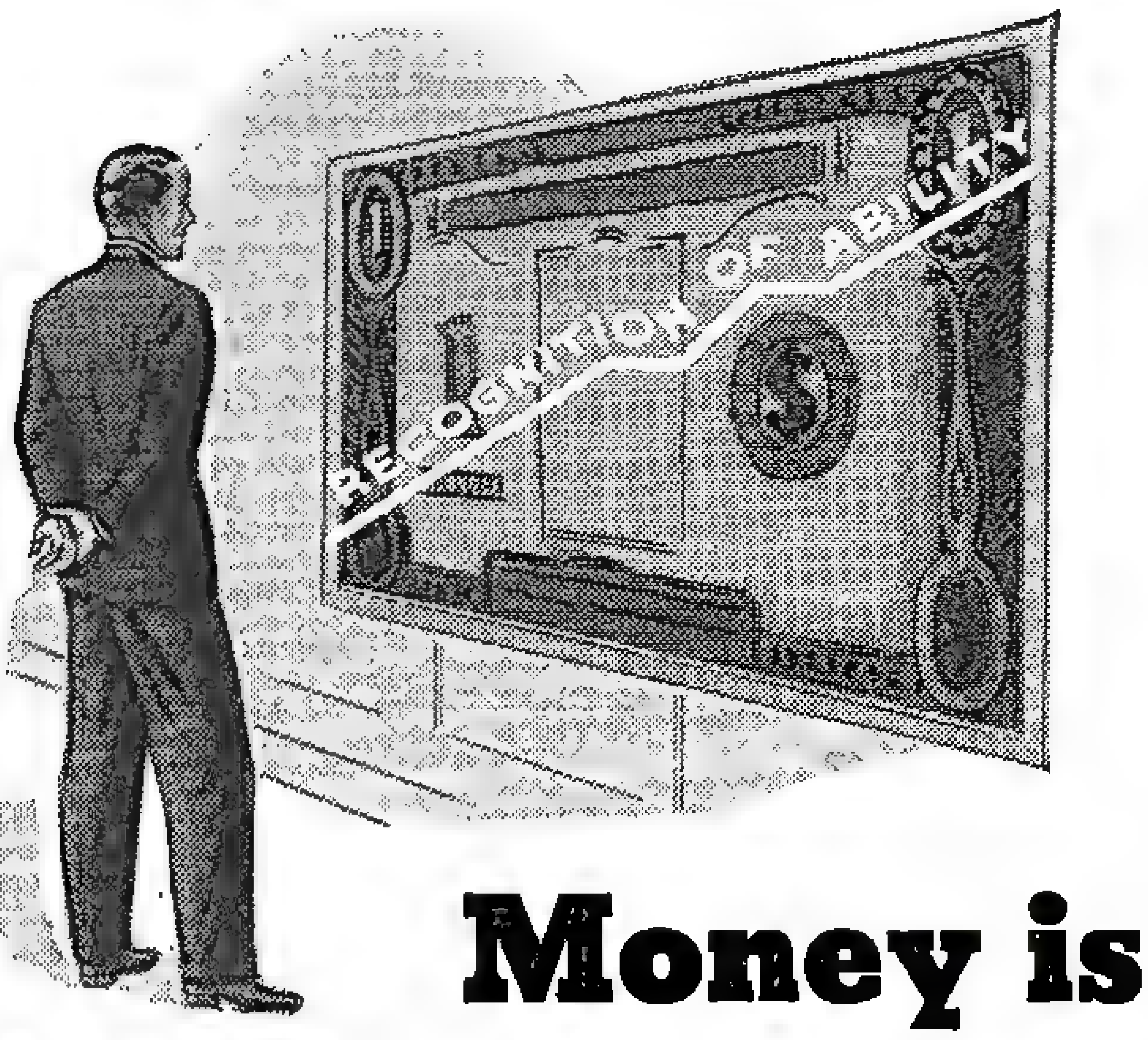

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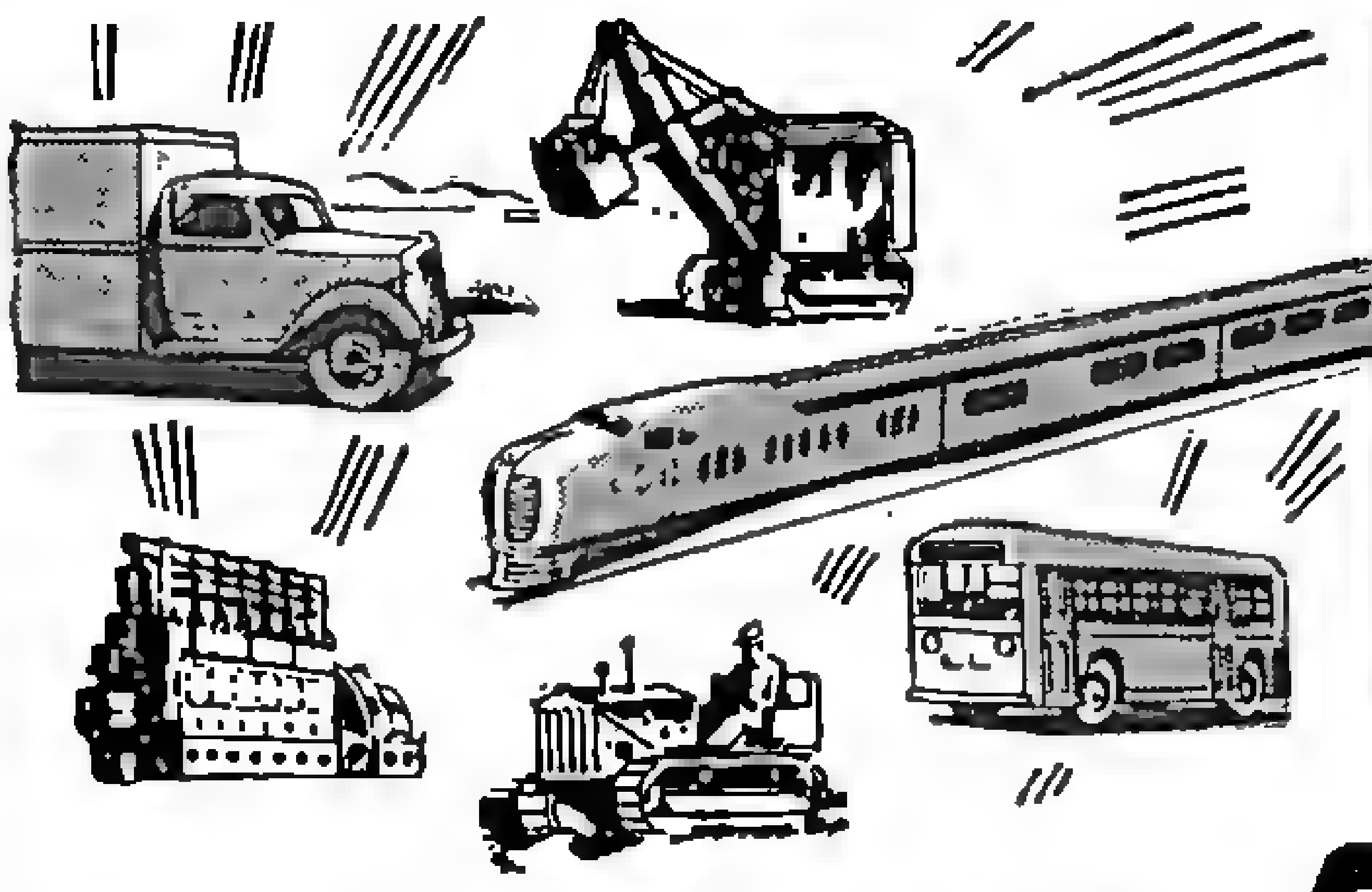

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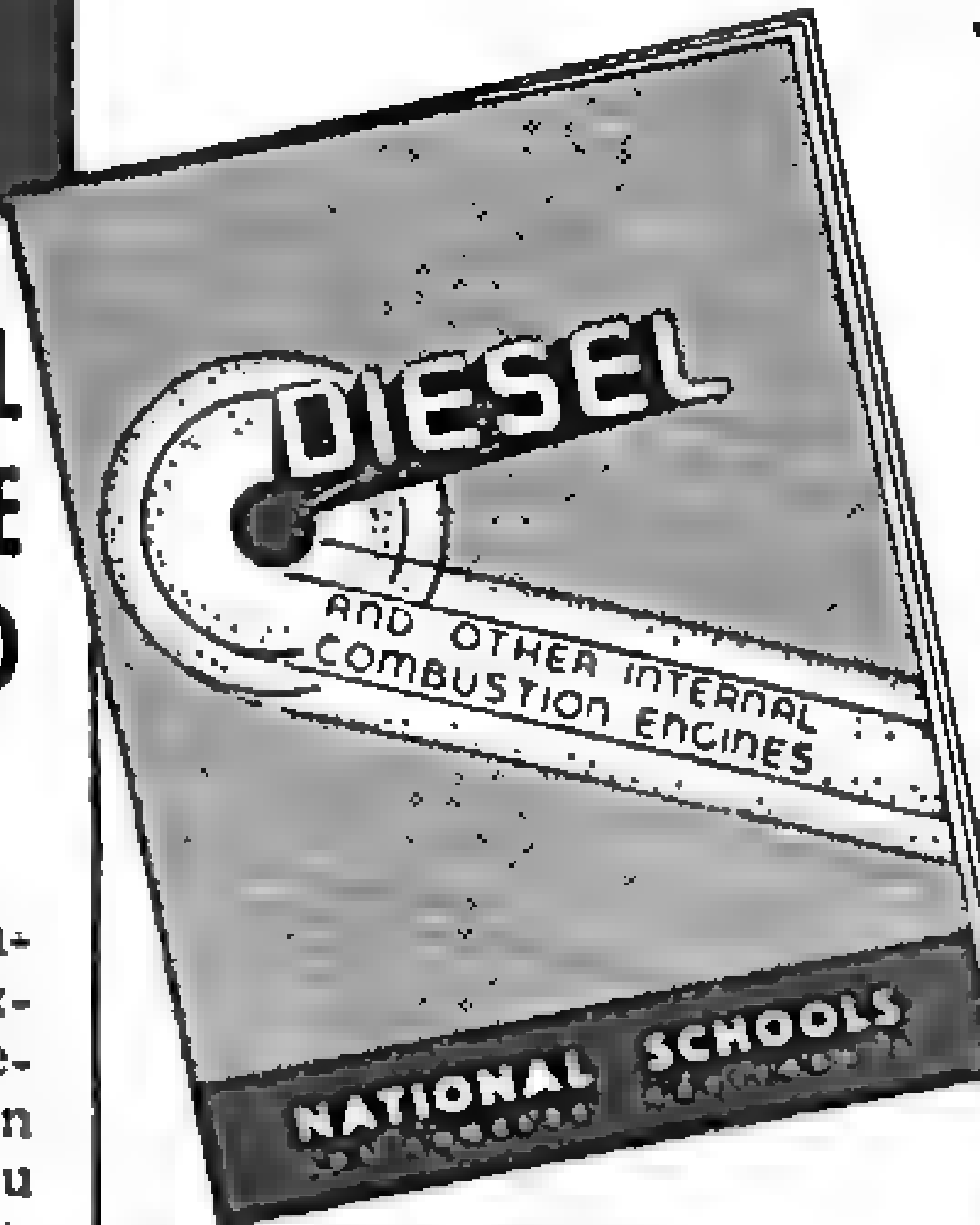
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by
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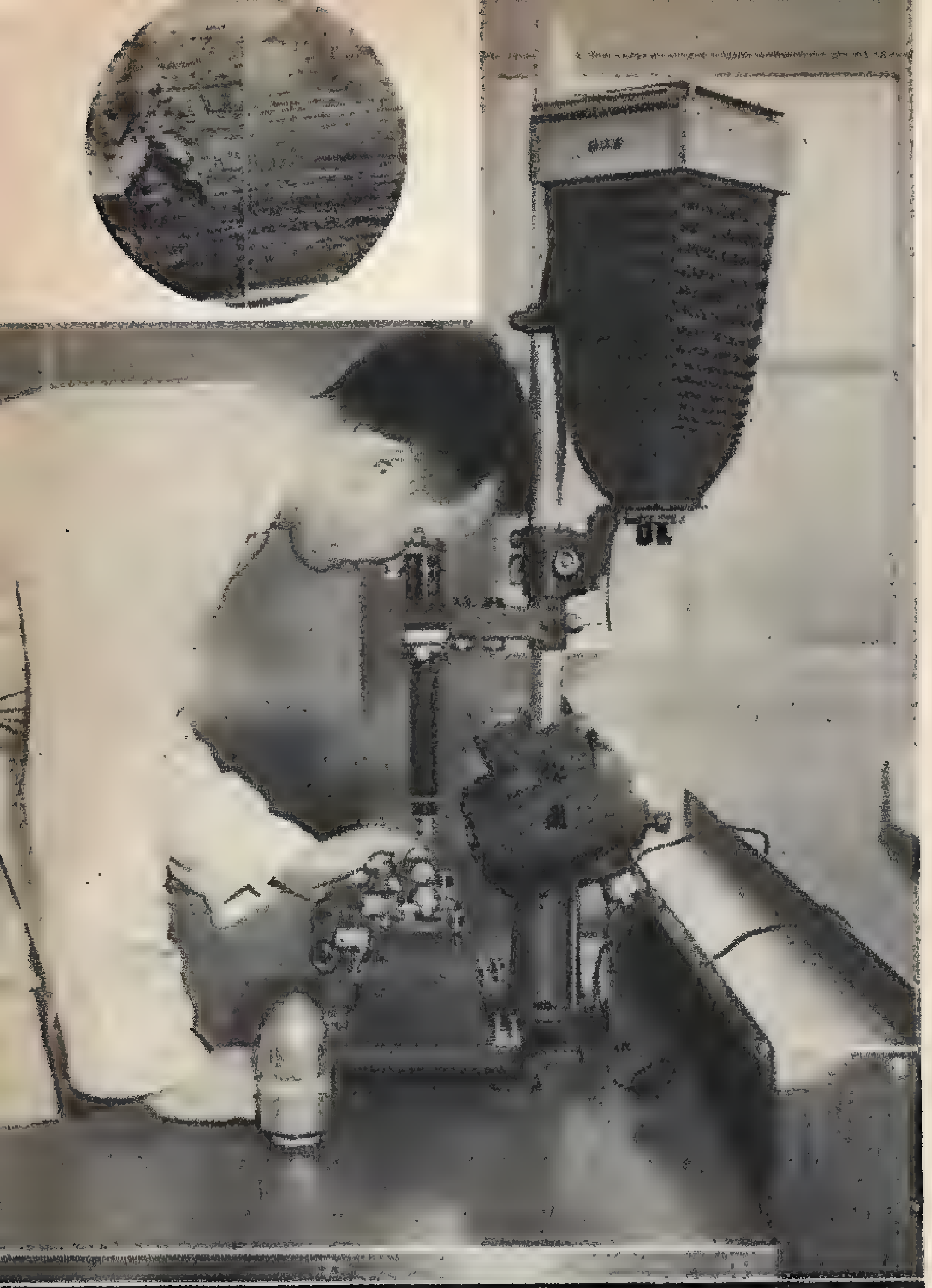
an interview with

J. Edgar Hoover

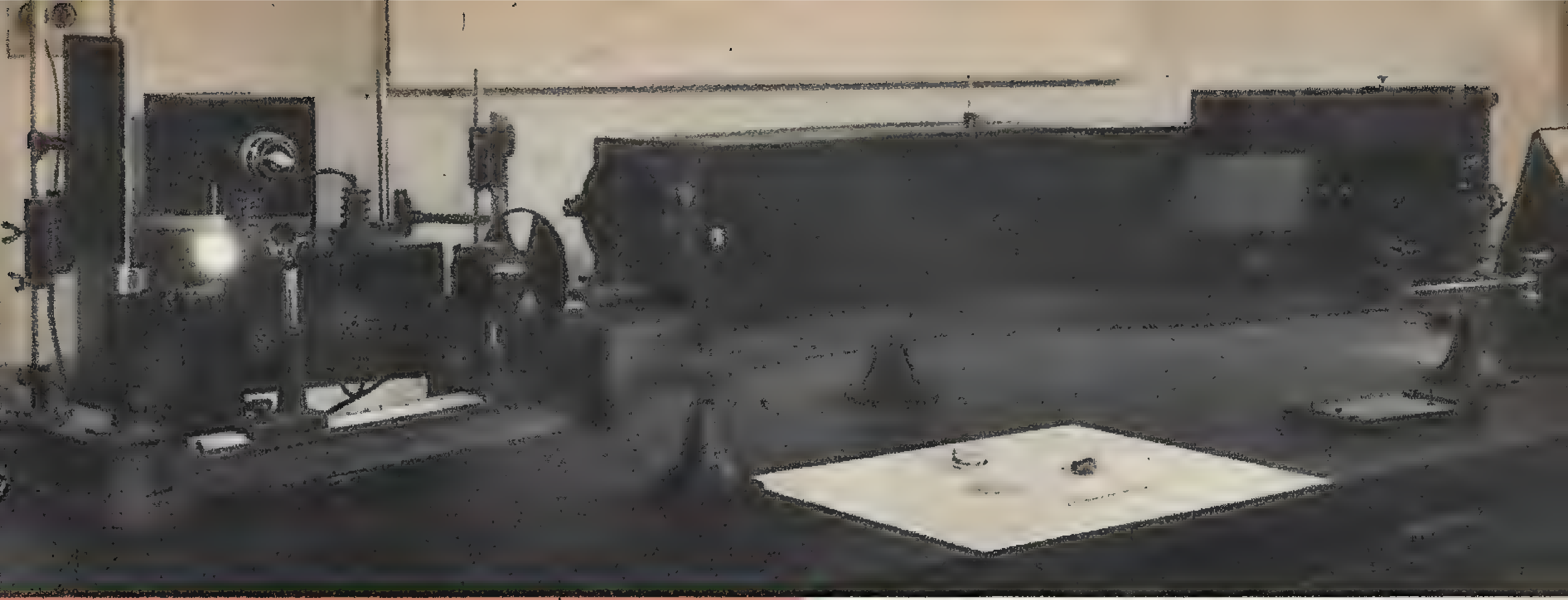
ON AUGUST 16, 1937, two men and a woman were sitting in an automobile in a remote section of the Chickamauga—a national military park in Georgia. Suddenly one of the men crashed an automobile crank over the head of the other and as the victim slumped, a pocket knife flashed and the sharp blade sank again and again into the bleeding body of the stunned man. In an effort to dispose of the car, it was set on fire in Chattanooga, where the partly destroyed machine was found the next day by authorities. On the same day that the mutilated body of the victim, James C. Revels, was found, Roy Weathers and his wife, Virgie, were picked up by authorities for questioning, and on



A G-Man technician at the comparison microscope checks a bullet fired from the gun of a suspect. The inset shows how two bullets from the same gun have similar markings. Below: experts collect dust and debris from clothing for microscopic study.

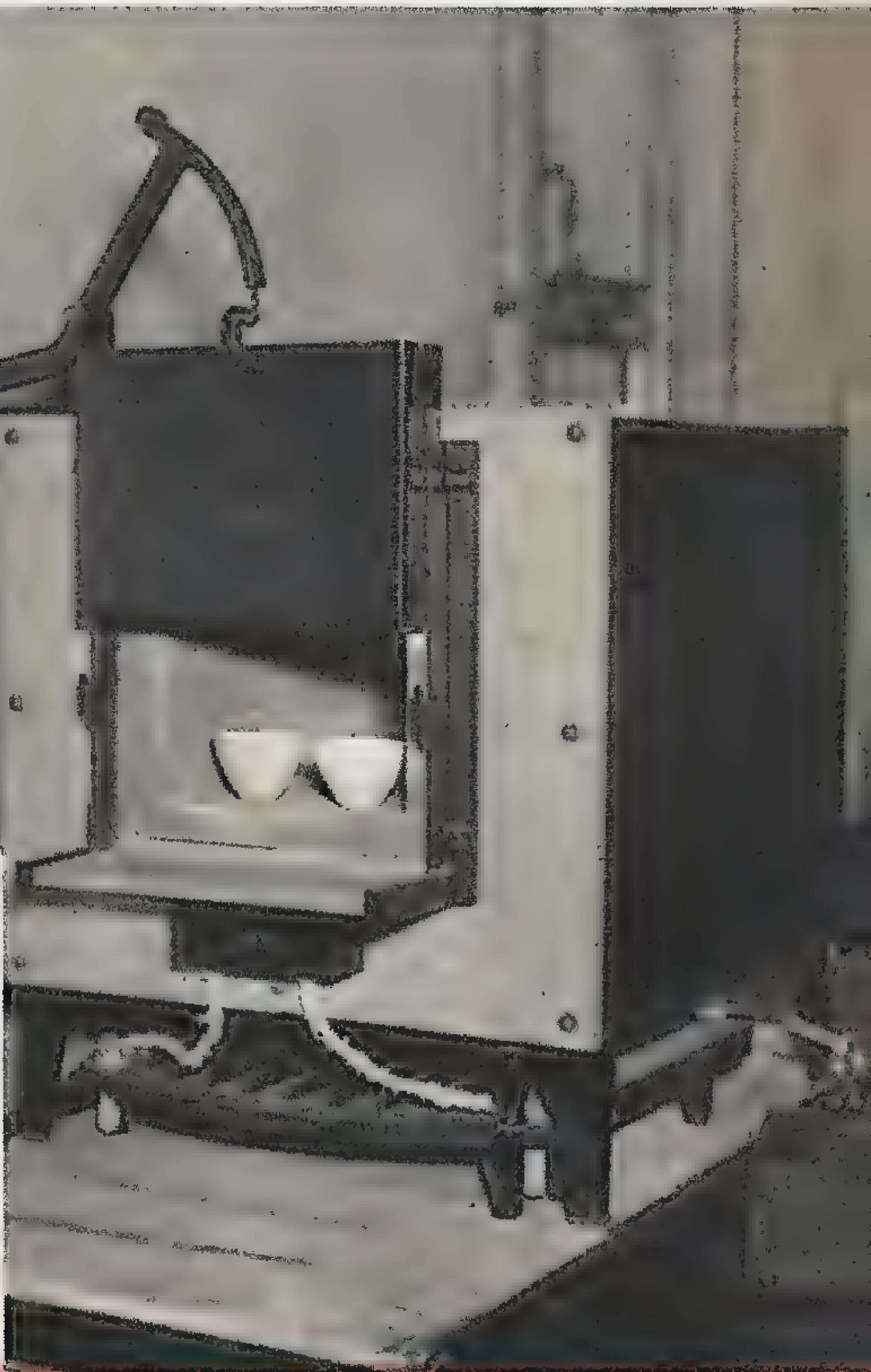
August 21, they admitted the crime which they later repudiated in part. In the subsequent investigation conducted by the Federal Bureau of Investigation, the Bureau's crime laboratory established that soil picked up at the scene of the murder contained human blood. The clothing of the defendants and the automobile crank were also shown to contain blood and the pocket knife fitted rents in the victim's clothing. Minute bloodstains were found on parts of the automobile, in spite of its burned condition, and this evidence resulted in the conviction of the defendants.

This murder was solved in the crime laboratory of the Federal Bureau of Investigation, in Washington, where scientists are performing feats which would startle the imagination of a Sherlock Holmes. With microscope, ultraviolet lamp, test tubes, spectrograph, refractometer and parallel light rays, science tracks down America's most vicious criminals. Bloodstains, human hairs, scrapings from under fingernails, burnt letters and threads of cloth tell tales of the dead to scientists trained in crime detection. No examination is too complicated for the G-Men of science, who last year alone made nearly 7,000 examinations involving over 33,000 specimens of evidence.

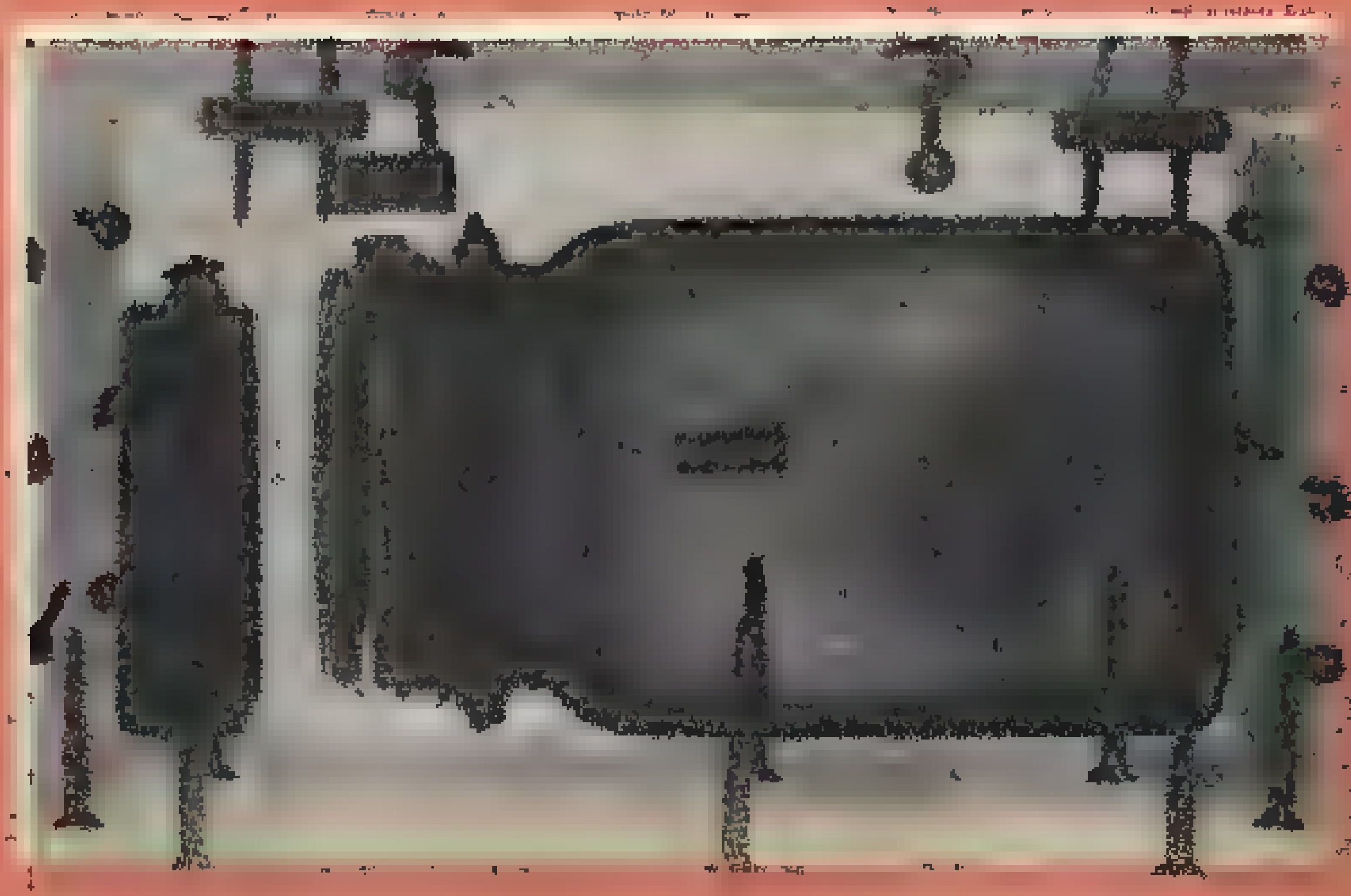


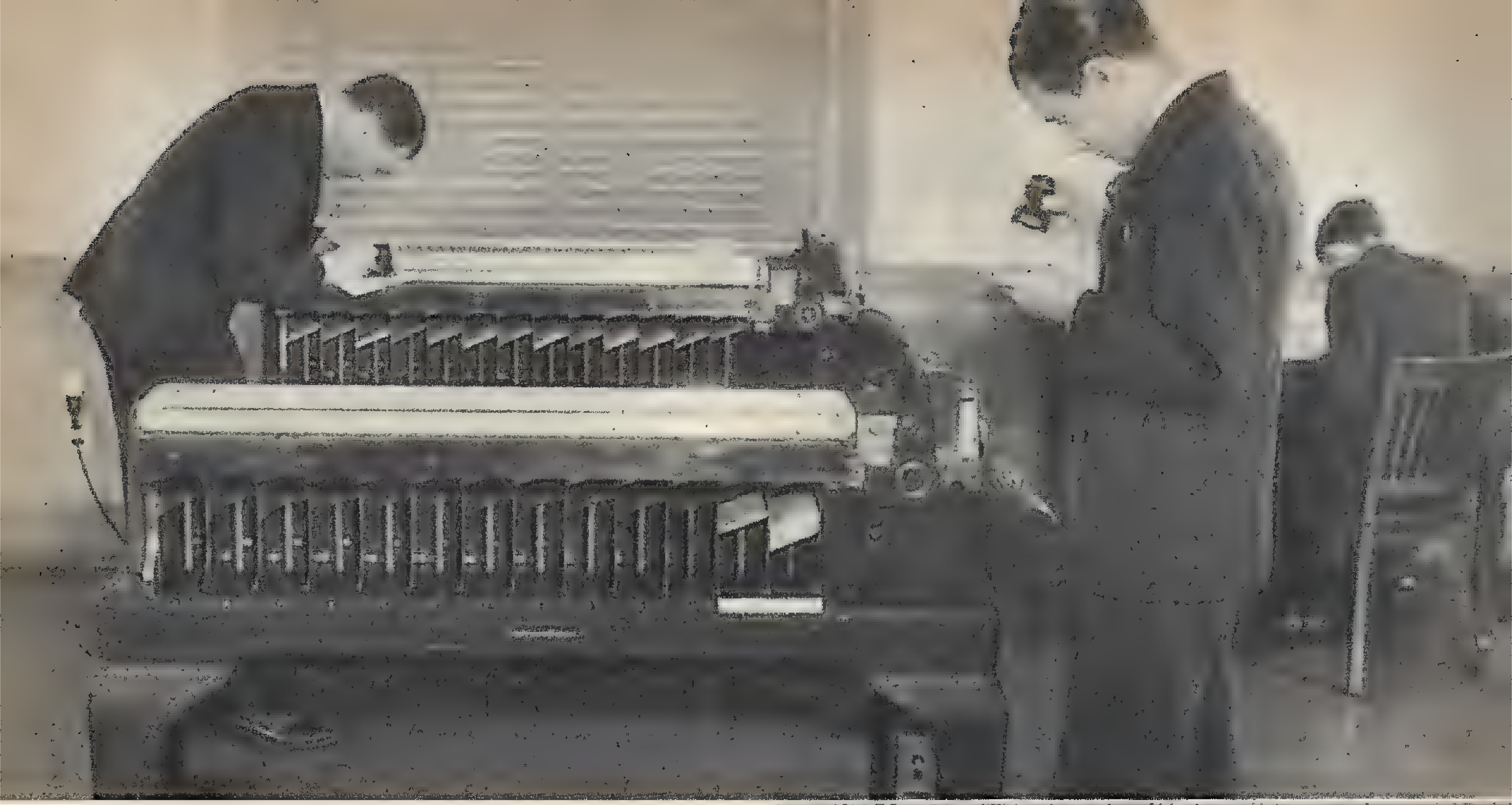
The spectrograph breaks up light into its component wave lengths or colors for analysis. It reveals markings on writing pads and other impressions.

On the FBI's scientific staff are men engaged in the work of document identification and firearm examination. Others are experts in geology and metallography, particularly as they relate to soil analysis and the examination of metallic instruments from which identifying numbers have been removed. Problems relating to sound, radio and electricity are handled by qualified technicians. A reference collection of rope and cord and specimens of hair and fibres, as well as equipment for making moulage or plaster re-



Above: Electric muffle furnace burns material for comparative analysis. Right: X-rays are used to expose the contents of suspicious packages. Sometimes the technician sees such objects as the homemade bomb shown below.



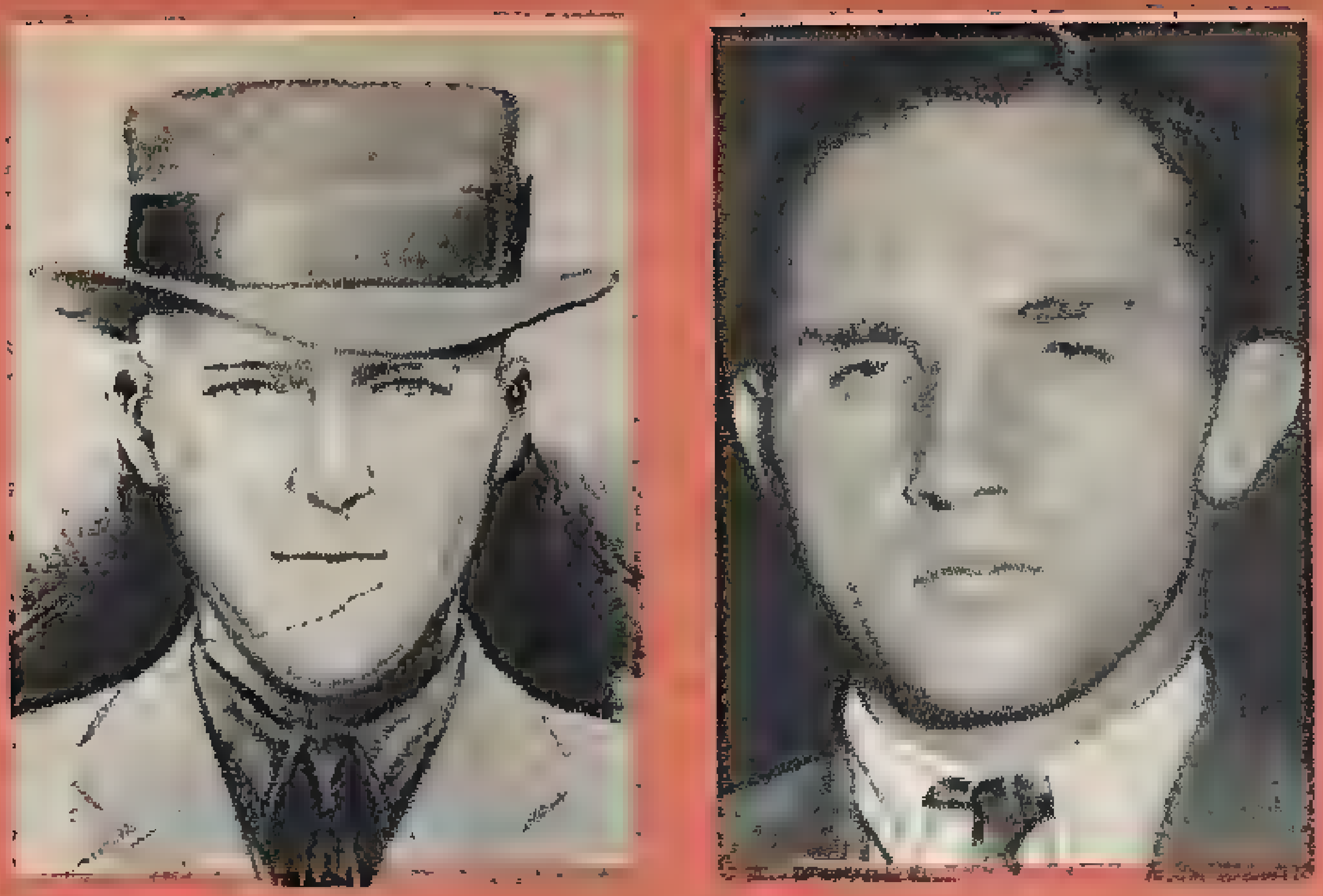


productions of sections of the human body, tire treads and footprints, are part of the tools of these scientific G-Men.

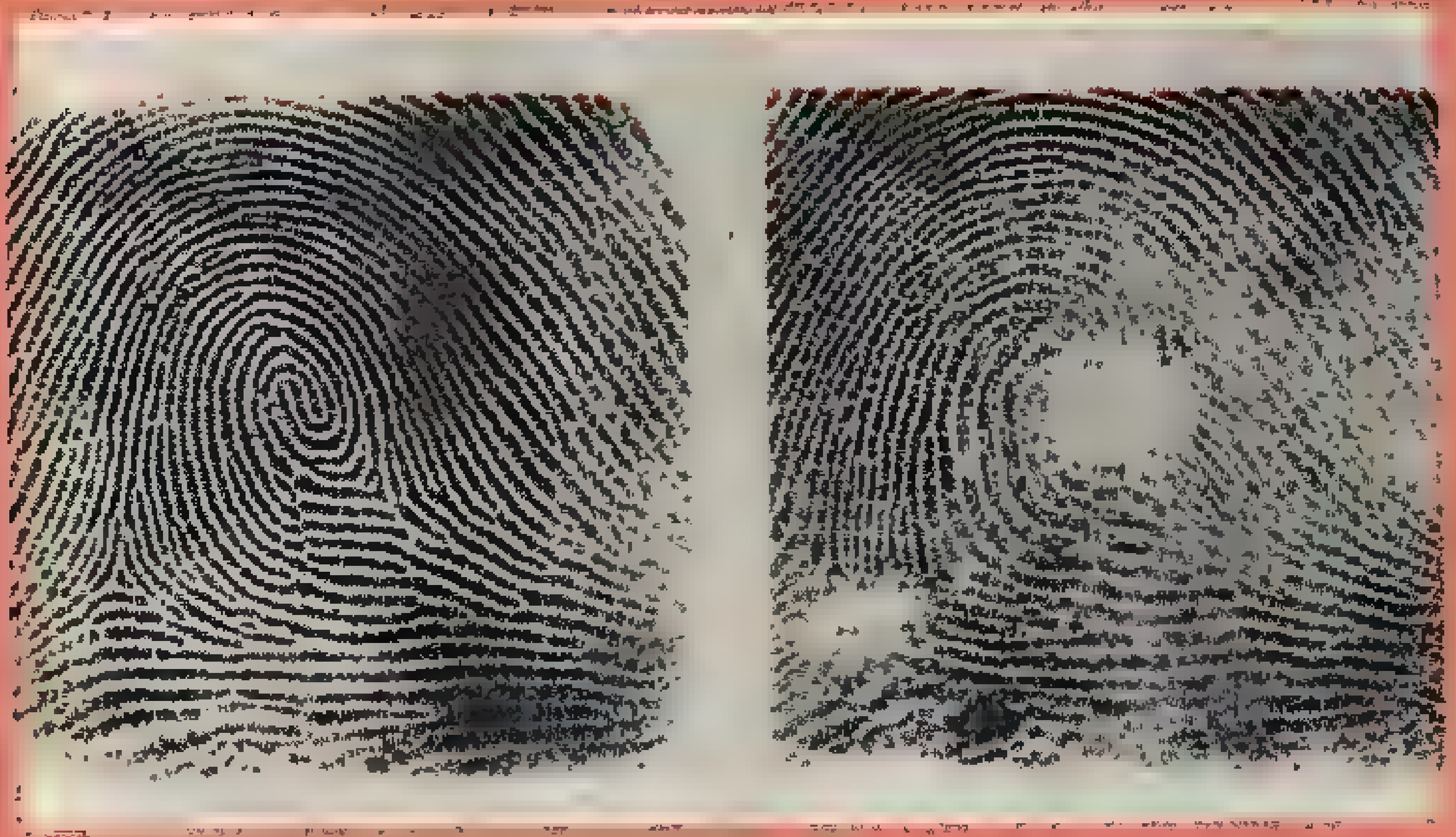
The above finger print machine automatically sorts cards in the larger finger print classification group, simplifying identification. The technician below is staining paper fibres for microscopic examination to determine the source of raw material.

Not least among scientific methods in crime detection is the fingerprint division, containing over 9,000,000 prints—and a special file of nearly 14,000 fingerprints of America's worst criminals. The work of this bureau has proved the infallibility of lines and whorls and deltas of the fingertips so that a man may be identified no matter what changes have taken place in his physique, his facial characteristics or his name. How well the identification bureau works in tracking down public enemies was illustrated in the kidnaping of Edward G. Bremer of St. Paul, Minn. In seeking out every bit of evidence in this case, which occurred on January 17, 1934, G-Men picked up a gasoline can which, under chemical tests, showed a single fingerprint. Search through a special file revealed the print to belong to Arthur "Doc" Barker, a member of a murderous gang of outlaws with a record of bank robberies, plunder and assault throughout the Middlewest. G-Men trailed "Doc" Barker. They trailed his brother. They trailed his companions, Volney Davis, Russell Gibson, Bill Weaver and others, until they caught up with Alvin Karpis, who was cornered in New Orleans a year later. In all, 35 men and women who directly or indirectly played a role in the Bremer kidnaping were sent to jail or eradicated by death.

Like fingertips, even mechanical instruments have their tell-tale marks that reveal a picture of crime and bloodshed to scientific



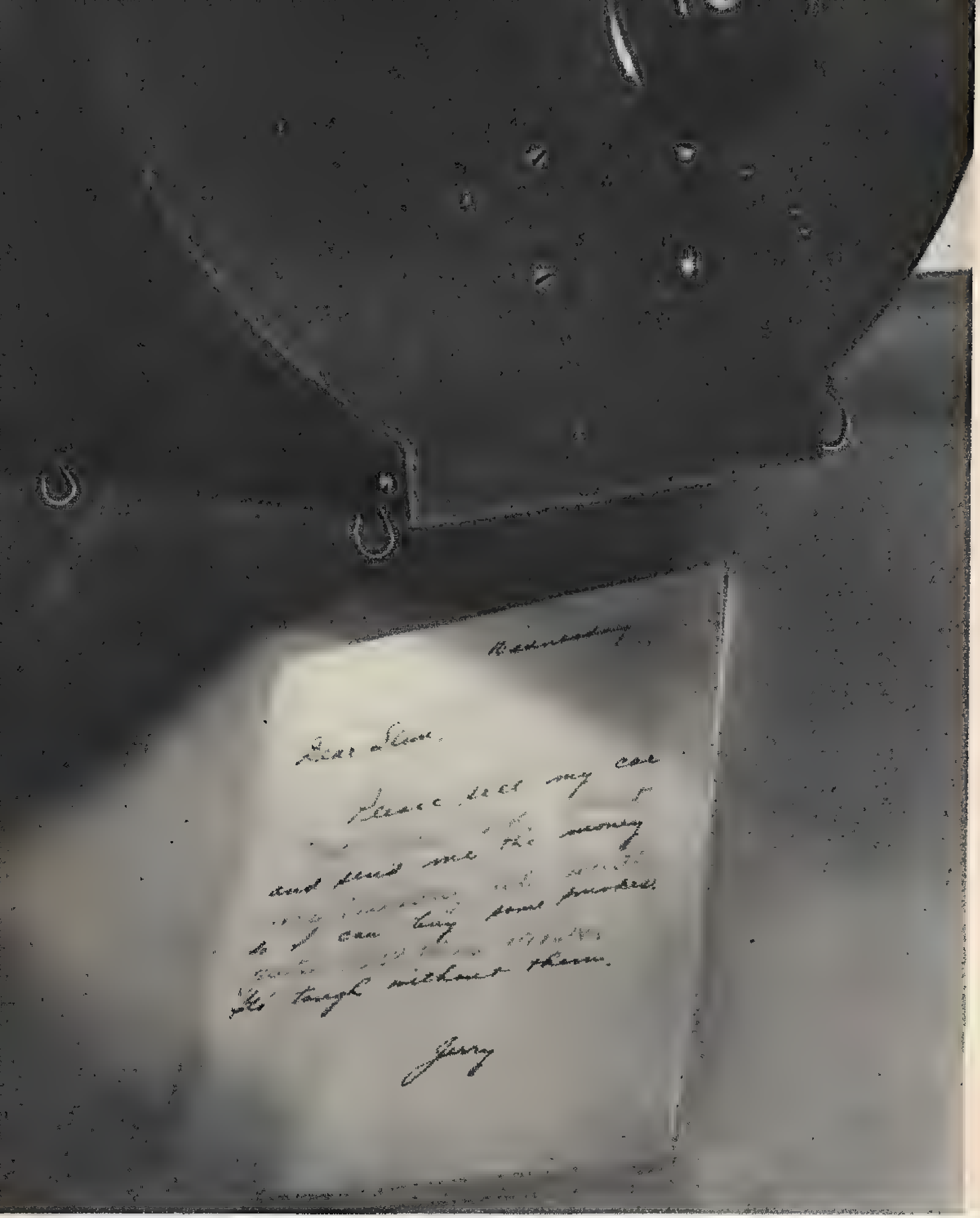
An artist's conception of the Lindbergh kidnaper shows a startling resemblance to Hauptmann, executed for the crime. When he was arrested, Hauptmann admitted having gained weight—rounding out his face.



G-Men established 324 points of identification between John Dillinger's original (left) and mutilated fingerprints (right). Moulage experts are shown at work below, reconstructing human hands and faces!

G-Men. A few years ago, when a prospector was found slain in a remote part of Alaska, the evidence in the case was taken by dog team across snow-covered wasteland and then flown to Fairbanks by plane. From there it was forwarded to Washington. This evidence showed that two persons were suspected. One was an ex-convict who was found leaving the area of the crime with a gun. He had blood on his clothes. The other was an Eskimo boy, also found in the neighborhood with a gun. At Washington the science laboratory examined the garments for human blood and the rifles for camparison with the murder bullet. Upon completion of the examination, word was sent to Alaska that the ex-convict was innocent and the blood found on his garments was that of an animal, as he claimed; but the bullet taken from the victim carried the same markings as a bullet fired from the gun of the Eskimo, and when confronted with the evidence, the boy admitted his guilt. A comparison in the G-Men's laboratory showed the two bullets to have identical markings.

How the microscope and chemical analysis helped solve a crime that occurred April 5, 1936 in Jacksonville, Fla., was revealed



Wednesday

Dear Sam,

Please sell my car
and send me the money
so I can buy some smokes.
It's tough without them.

Jerry

when the Florida state attorney called at the FBI's technical laboratory with evidence relating to the mysterious and brutal murders of Kate Powell and Lou Speer. They were killed in their home and the bodies were carted to the outskirts of the city and dumped in the river. During the course of the investigation bits of charred material were found near the river bank, indicating that someone had tried to burn clothing. A partially burned coat was found to be of the same material in a suit formerly owned by Marcus Powell, the husband of one of the victims. Several fragments of a pillow case and a piece of toweling used to gag one of the victims were also found in the region.

The staff of the crime laboratory found that a comparison

Left: Ultraviolet machines are used by the crime laboratory to discover secret writing. Note the message as it appears dimly between the black lettering. Technician below is weighing paper on analytical balance to discover its characteristics.

of the charred coat material with the pants and vest of a suit belonging to Marcus Powell revealed the material to be identical. To effect this identification it was necessary to burn some of the uncharred material in an electric muffle furnace in order to produce in the known specimens fire conditions similar to that of the questioned material. A microscopic examination of the vest revealed minute blood particles. The toweling used for gagging the victim was found to be the same material as the kitchen towels in the Powell home. Microscopic examination of the unknown material showed that they consisted of bits of a cotton blanket and portions of a rug. The case against Marcus Powell, a former convict who had been twice before tried for murder, grew and eventually resulted in his conviction.

Among the technical equipment used by the crime laboratory in its war against public enemies is the parallel light ray, designed to reveal markings on paper and other surfaces ordinarily not visible to the naked eye. This machine is used frequently in studying ransom notes and writing pads from which ransom-note paper is alleged to have been taken. An example of its practical application was in the Dr. J. C. B. Davis kidnaping at Willow Springs, Mo. The doctor was kidnaped and held for $5,000 ransom and a note identified to be in his own handwriting gave instructions when and where the money was to be paid. G-Men were notified and within a few hours a staff of investigators arrived in Willow Springs and a temporary laboratory was set up.

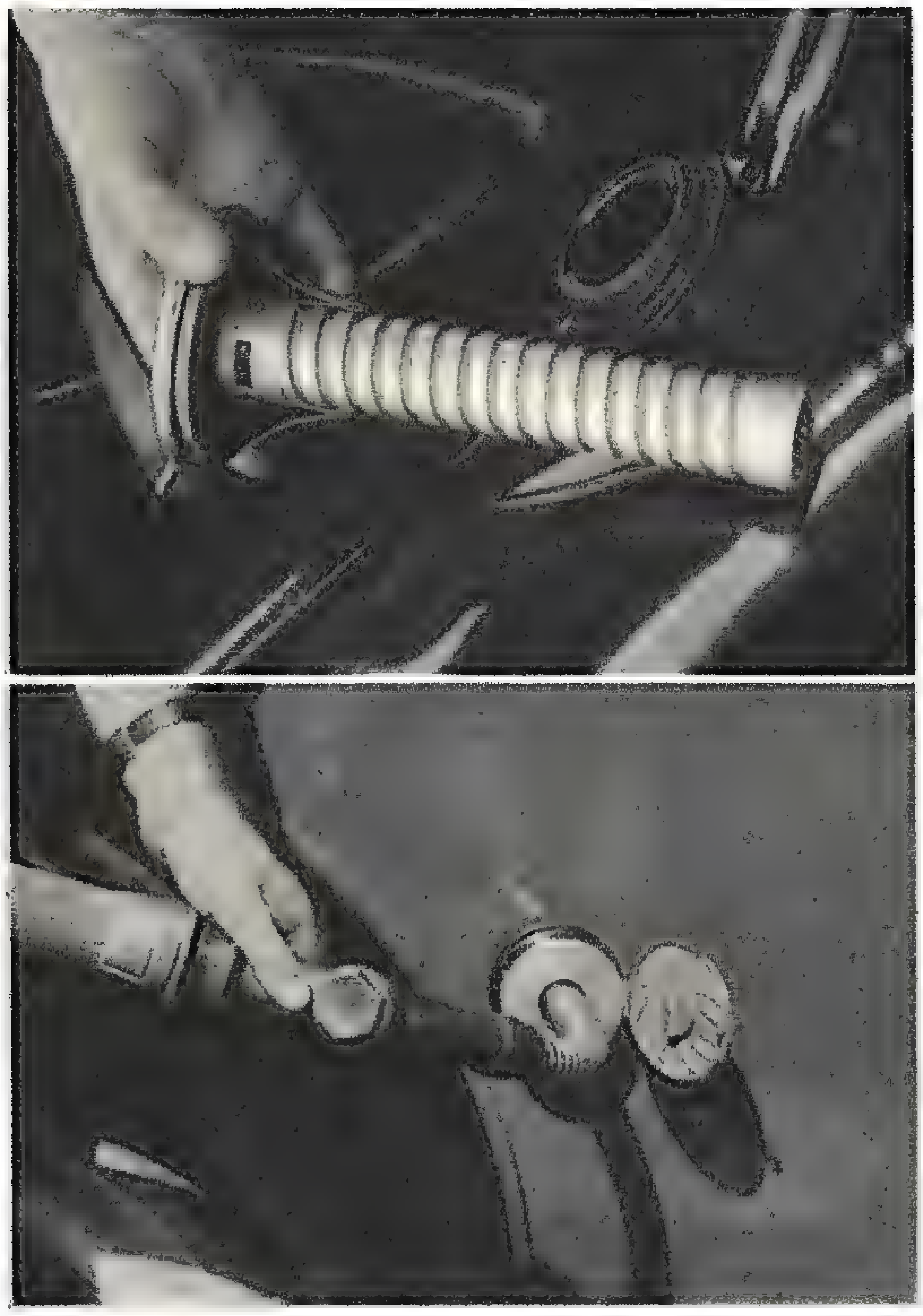
The paper on which the ransom note was written could not be identified and a search of all stores within 50 miles of the kidnaping failed to reveal paper of similar characteristics. Seven days after Dr. Davis had disappeared, a suspect was picked up and a search of his belongings revealed paper of the same type as that on which the ransom note was written. This suspicion was verified by laboratory examination, which also revealed that markings corresponding to writing on the ransom note were impressed on a blank sheet of the writing pad found on Kenyon, the suspect. The identification was completed when the markings were read under parallel light rays. In the meantime, another ransom note was received demanding the $5,000 payment.

Shortly thereafter G-Men found the body

[*Continued on page 75*]

Frequently suspect's clothing is examined for traces of blood and stains are sometimes analyzed to determine if they are human or animal blood. Many such analysis mean life or death to the suspect. Technicians are shown using Benzidine solution to determine presence of blood.

Gas Tank Cap Is Theft-Proof



A NEWLY developed theft-proof gas tank cap is fitted with a flexible spout (top) which is installed permanently within the neck of an automobile's regular gas tank, (lower). An internal grill prevents siphoning of gas by thieves and eliminates "blow back" caused by air in the tank at filling time.

Buttons Control RR Signals

ELECTRIC trains crossing the San Francisco-Oakland Bay Bridge operate under a modern electric interlocking and signal system which is actuated by a push-button control board only 6½ feet long (top). A mechanical lever system of similar capacity (lower) would require 60 feet of space.

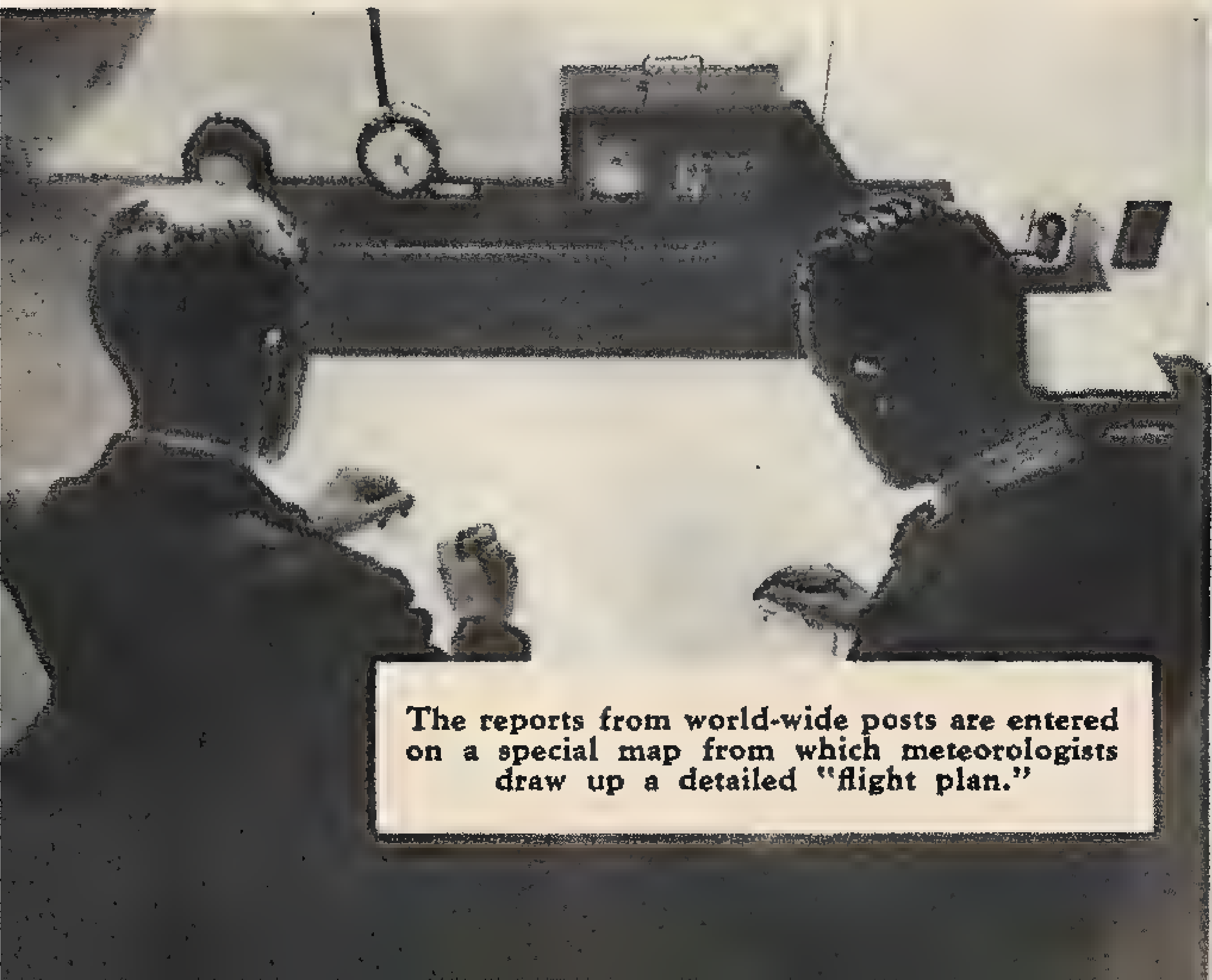
Actor Invents Rubber Movie Masks

LIVE rubber masks which may revolutionize the art of make-up in motion picture horror roles have been developed by Cliff Arquette, radio and screen actor, who is known as the "man of a thousand hobbies." The inventor says the masks will enable actors to control facial expressions, thus making the artificial faces seem alive. The porous quality of the rubber will permit air to reach the pores of the actor's face, eliminating skin diseases.

CHARTING WEATHER FOR THE "CLIPPERS"

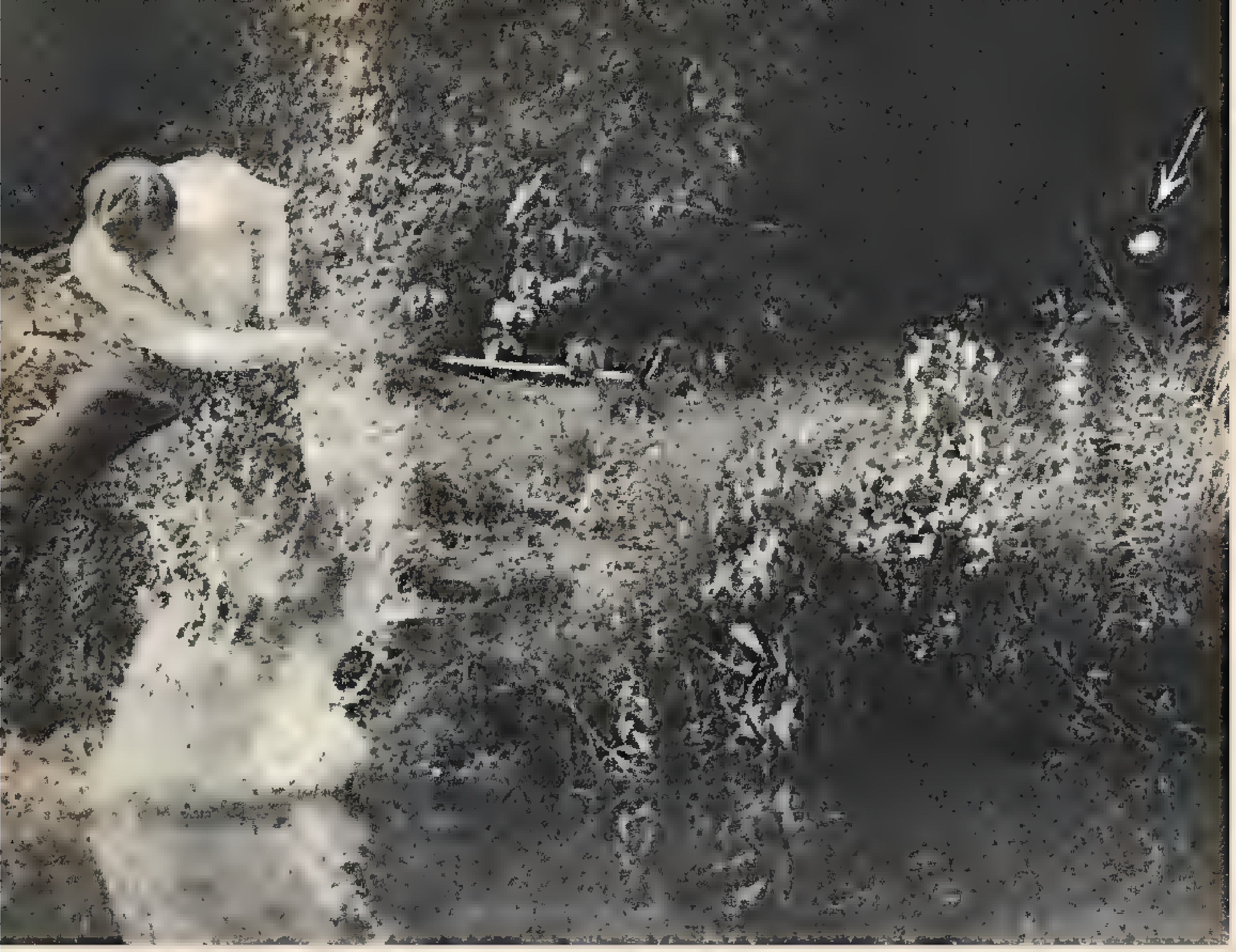
A decade of intensive development of weather observing and reporting by Pan American Airways has resulted in a technique embracing observations on land and sea leading to the charting of conditions at the surface and in the upper air on a basic weather map from which is plotted the detailed flight plan for the schedule at hand. Below—Before a flight starts, pilots and meteorologists confer on predicted weather.

Above—Many ships serve as weather stations for the ocean-flying lines, sending aloft balloons to determine, by theodolite recordings, the wind speed and direction at various altitudes, the information being radioed to flight stations ashore.



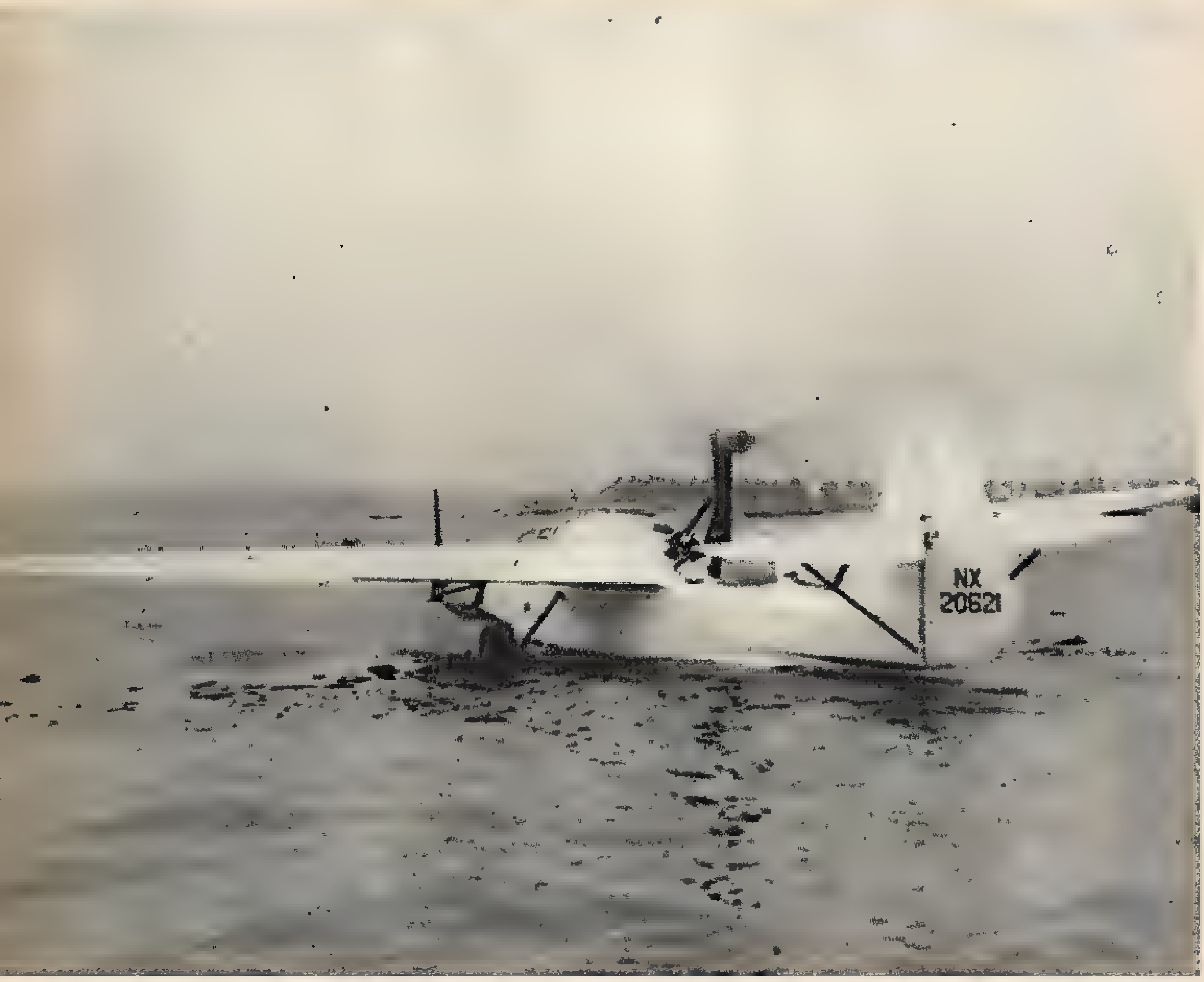
The reports from world-wide posts are entered on a special map from which meteorologists draw up a detailed "flight plan."

Constant radio contact with the flying clippers keeps the captains supplied with supplementary weather data enroute between terminals.



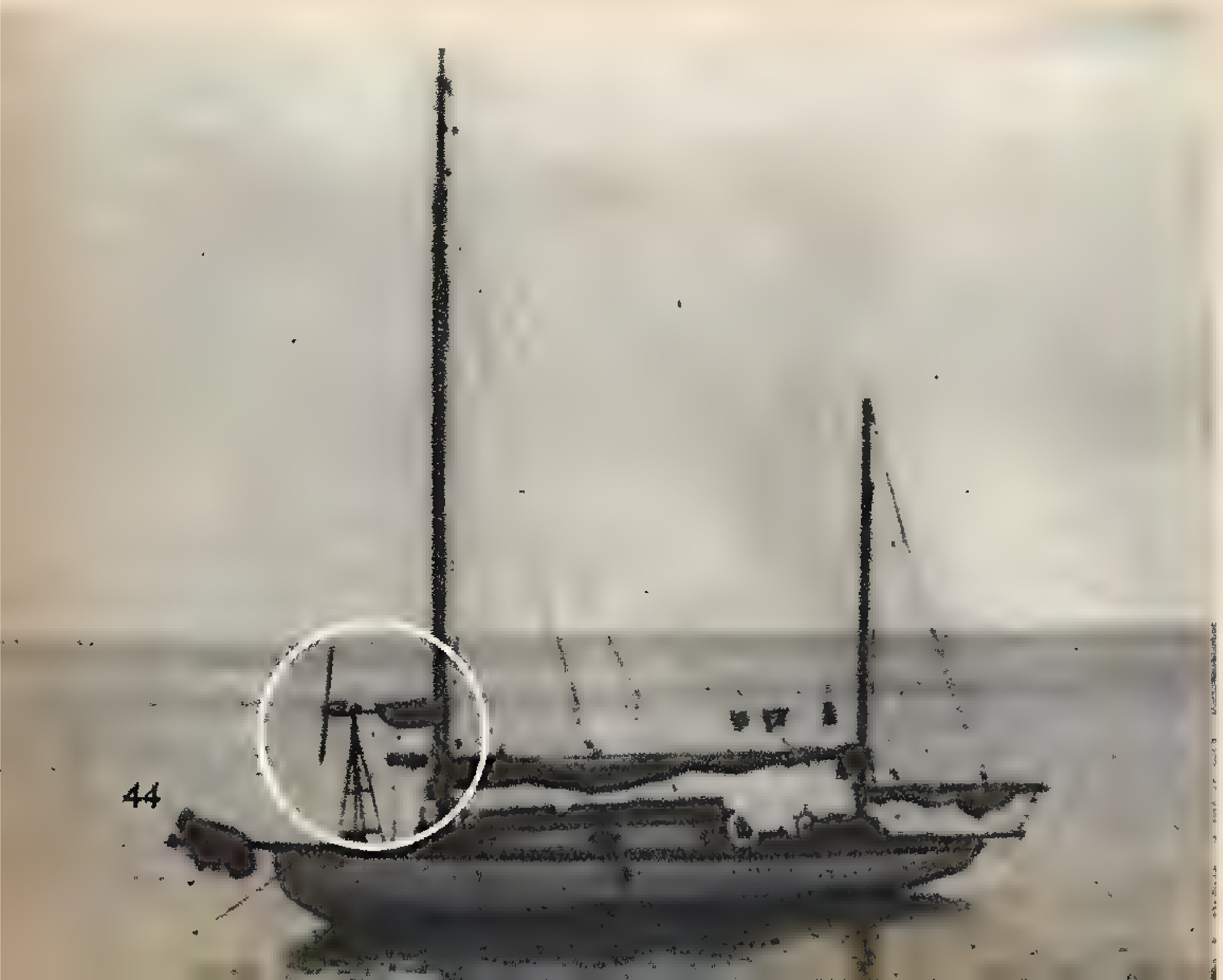
Camera Snaps Speedy Golf Ball In Mid-Air

THE remarkable action photograph at left shows W. Stanton Barbour driving his golf ball out of the water during a play in a championship match held on the Ridgewood (N. J.) Country Club course. Barbour got doused with water as a result of his efforts, but the ball sailed away high and dry. The camera snapped the ball in the position indicated by arrow, as well as the water splash.



New Plane Has Novel Propeller Mounting

A NEW type of amphibian plane featuring a Zeppelin-type gear-drive propeller which is connected to a 125 horsepower engine mounted in its hull by means of an extension shaft as shown in photo, has been developed by P. H. Spencer, of Farmingdale, L. I. Weighing 2,200 pounds loaded, the plane has a wingspan of 40 feet and an overall length of 26 feet. Another outstanding feature of the amphibian is its pontoons, the rear ends of which are fitted with wheels for making ground landings.

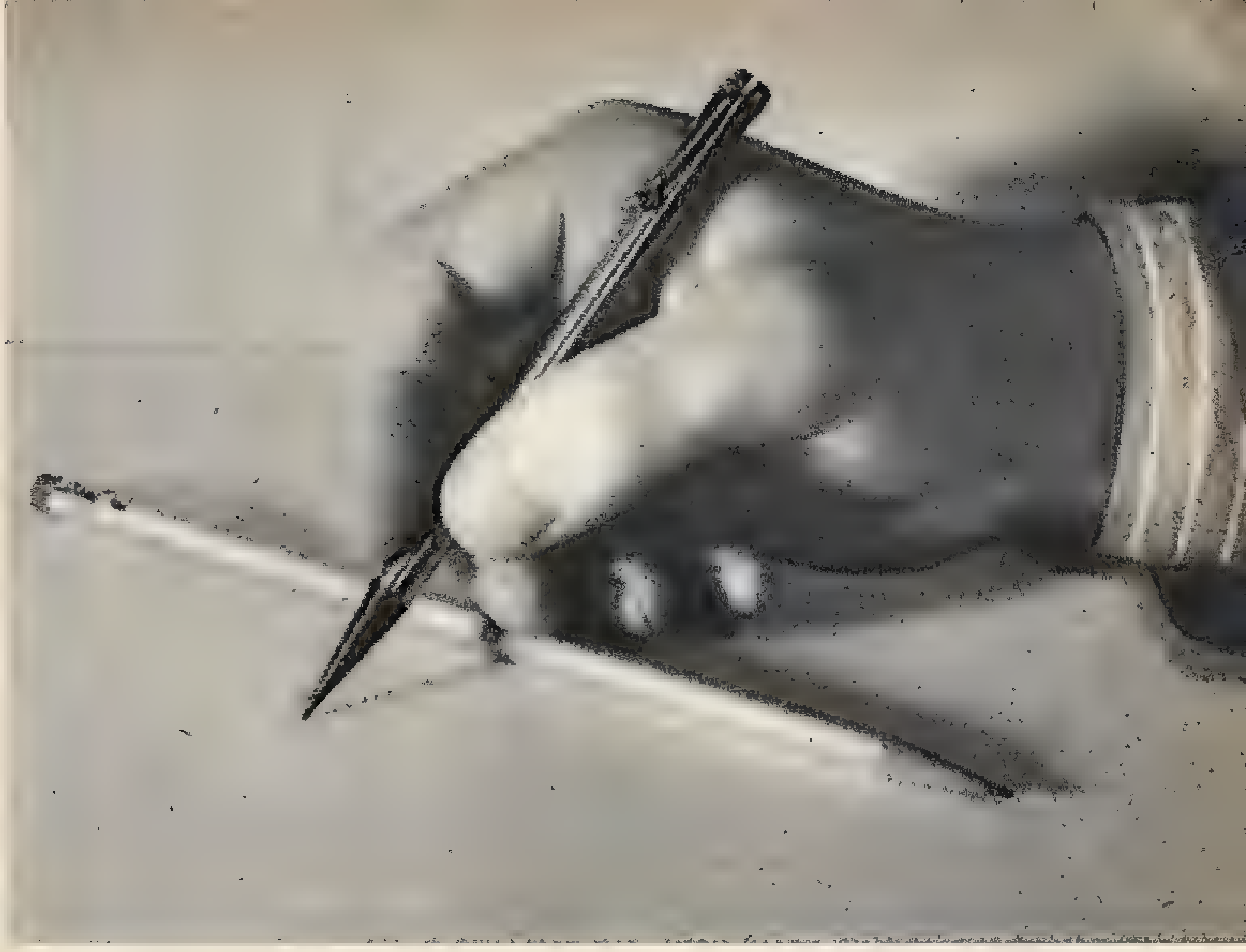


Windcharger On Boat Solves Light Problem

INSTALLING a rural-type windcharger device on the deck of his sailboat, as indicated by the circle in photo, a boat owner in Tampa, Florida, claims to have solved the problem of generating sufficient electric current to operate running lights, cabin lights, etc., while afloat. The charger is said to produce no drag and, in fact, serves as an auxiliary sail under certain conditions.

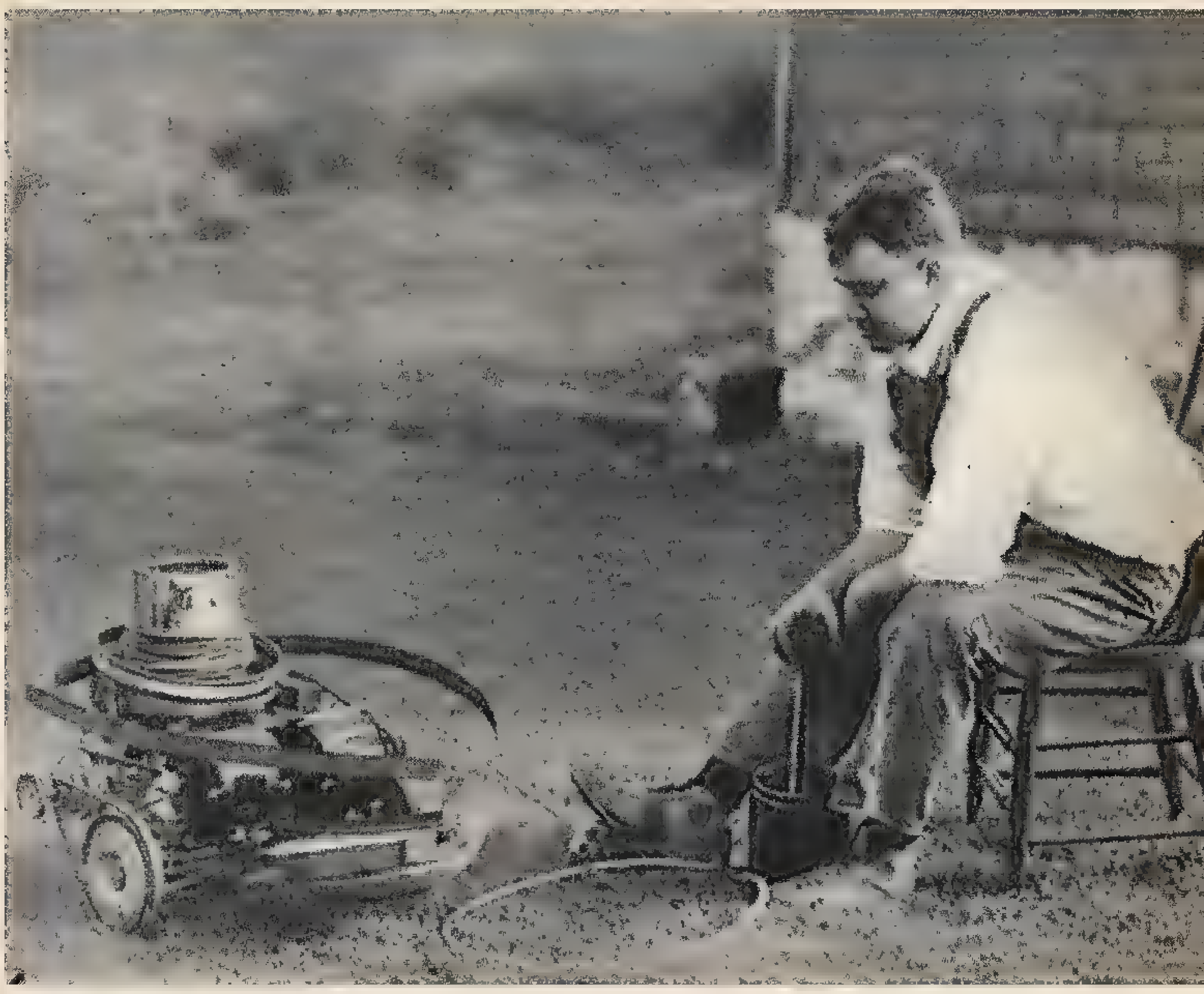
Solid Graphite Pencil Has Metal Coating

FEATURING a point that is much stronger than that of a wooden pencil, the novel pencil shown at right is formed entirely of solid graphite which is plated with copper and nickel. The metal coating which makes the pencil unusually attractive is so thin that it does not interfere with the sharpening of the pencil through use of an ordinary pencil sharpener device. A pocket clip is also featured.



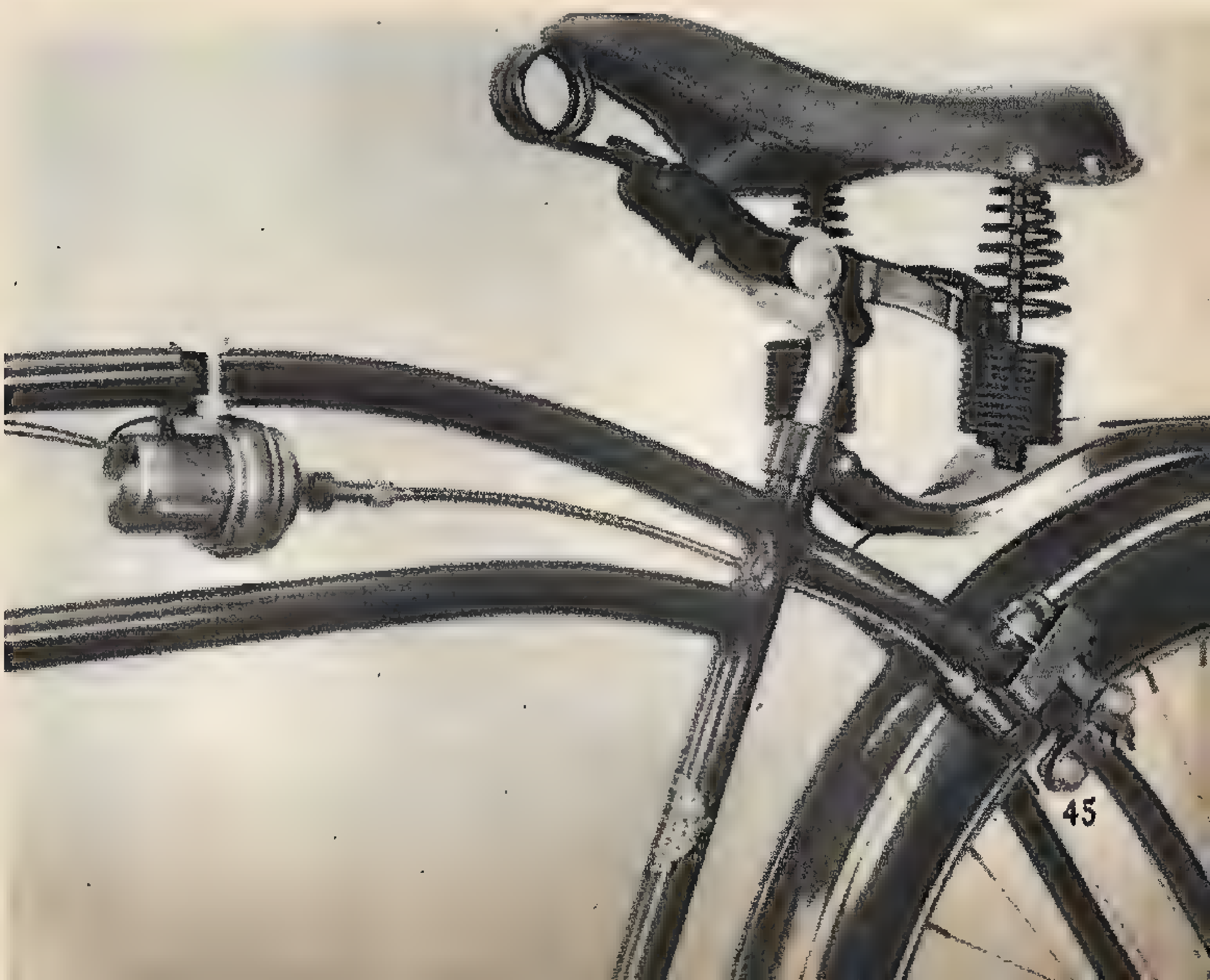
Builds Remote Control Lawn Mower Device

ATTACHING two electric motors, an old paint can, a wooden mixing bowl from a kitchen, sundry gears, wires and drive belts to a regulation lawn mower, Alvin Lodge, an unemployed mechanical engineer of Millersville, Pa., constructed a device that enables him to mow his lawn by remote control. As rigged up for its trial run, the mower successfully operated along a cable guide for a distance of 100 feet from the stationary control box shown being manipulated by the inventor.

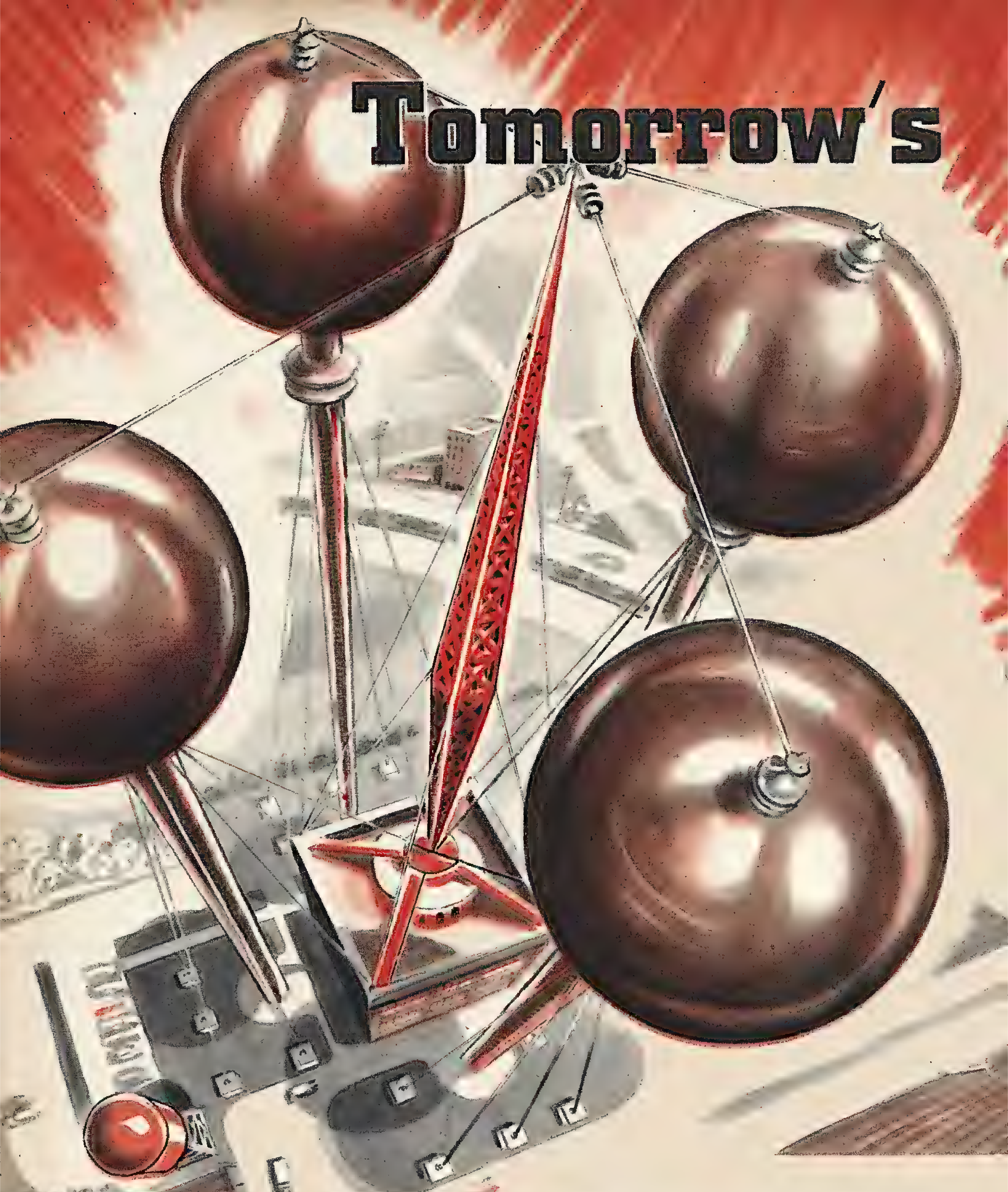


Bike-Lamp Generator Yields Steady Current

ATTACHED to the frame of a bicycle near the saddle, as shown in photo, a new generator is said to provide a constant source of electricity for the bike's lamp. The generator is connected by cable to a friction roller which contacts the rear tire, and yields a steady 5-volt current at all speeds due to a special voltage control, thus eliminating the danger of blowing out the bulbs.

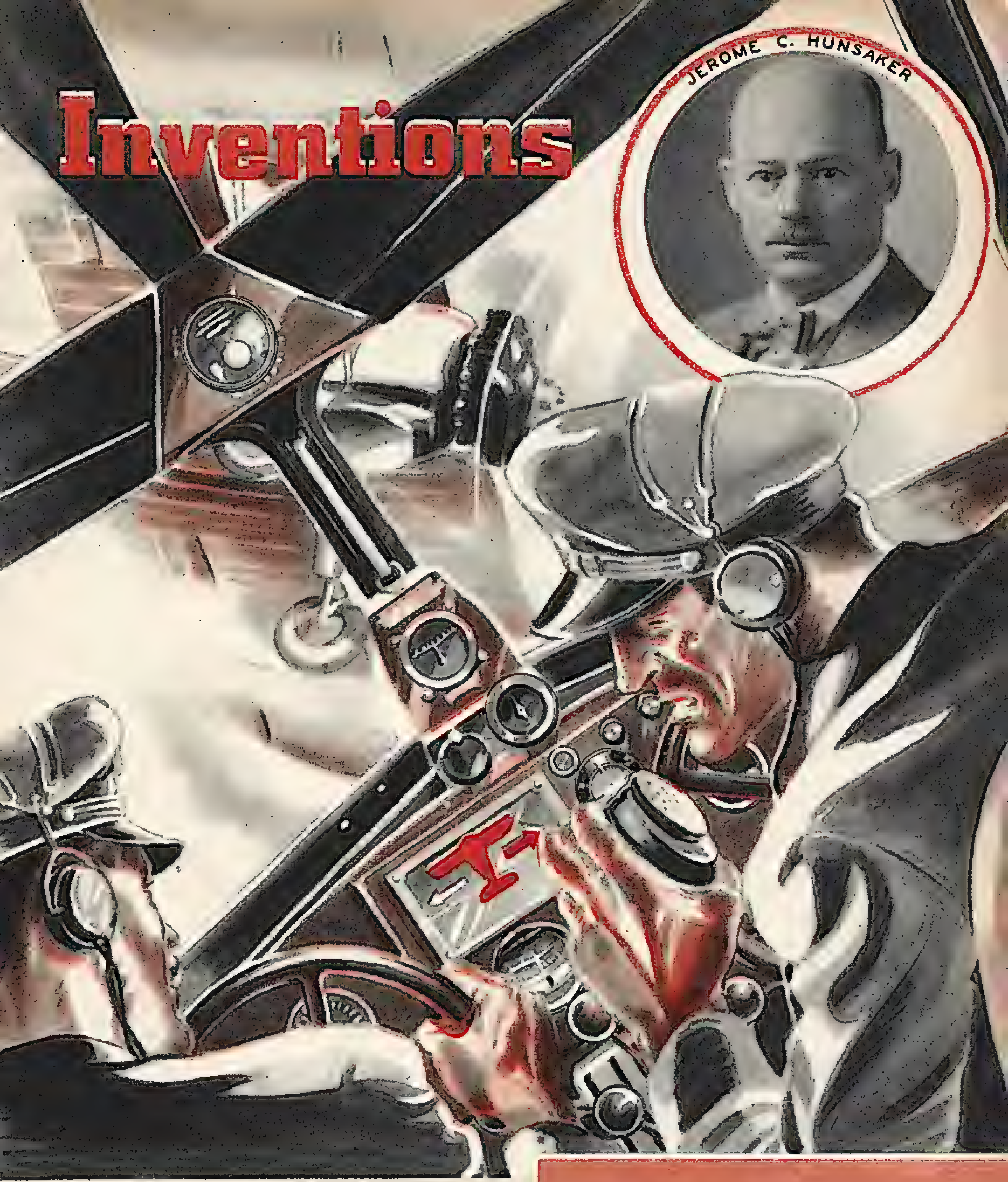


Tomorrow's



AN IDEA today may be an actuality tomorrow. For years scientists have been working on a means for utilization of solar energy and reports from the West coast indicate that some degree of success has been attained. On this page is visualized my suggestion that such utilization of solar energy might take the form of electrical, chemical or mechanical conversion of the heat of incident

Inventions



radiation which is nearer accomplishment than the-man-in-the-street realizes. The illustration on the right visualizes my suggestion for a warning device to avoid collision of airplanes when flying blind. It is not too much to hope for realization of these and other ideas suggested by engineers and scientists whose practical experience indicate a need for new inventions.

A NOTE ABOUT THE AUTHOR

JEROME CLARKE HUNSAKER is professor-in-charge, department of mechanical engineering, Massachusetts Institute of Technology. He is a graduate aeronautical engineer; was in charge of aircraft design U. S. Navy; developed wire and radio services for airways and has been honored by scientific societies throughout the world.

A real "scoop" for MI readers is this detailed report of flight experiences aboard the globe-circling Hughes plane.

The crew. Left to right—Edward Lund, flight engineer, Howard Hughes, pilot, Grover Whalen, New York World's Fair official who greeted the flyers, Lieut. Harry Connor, navigator, Richard Stoddart, radio engineer, and Lieut. Thomas Thurlow, navigator. Notice the battery of microphones.

EXCLUSIVE!

Hughes Flight

"MAKING the round the world flight under Howard Hughes' leadership was scientifically gratifying and so well planned that we all knew it was safe and that no so-called heroical physical courage was necessary," Richard Stoddart, radio expert, and Harry P. Connor, famous navigator, told *MECHANIX ILLUSTRATED* in an exclusive interview arranged by Albert I. Lodwick, aviation executive and Mr. Hughes' flight operations manager.

"I believe this will be a comprehensive story of what happened on the trip," Mr. Stoddart, the tall, soft-spoken wireless wizard, said, "and the story logically begins many months ago, and not with our take-off for Paris, as the crowd probably believes.

"I know now more than ever before that when Howard Hughes sets out to do a thing he does it with scientific thoroughness and has every right to expect the ultimate in success. There is no use trying to compare him with any other person I know about, now or in history. Well, as I said, as soon as our ideas were integrated an intensive search for the very best equipment was inaugurated.

"We found that some of the technical apparatus which we needed didn't exist. The prime case-in-point is in the matter of the radio instruments. None were available which could handle either the type or range of the work which we wanted to do.

"There was airline equipment, yes. Some of it very good. But we needed something of a far greater technical perfection, so we had to design our own transmitter, which was produced for operation on a wide range of frequencies. You'll realize how wide I mean when I tell you our range was from 330 kilocycles to 23,000 kilocycles. We had seventeen frequencies. It took us several months to design just what we wanted, and then we had to superintend its construction.

"After that there came long periods of testing all of our instruments on the ground and, finally, in the air. But eventually we were satisfied with what we had devised. We found our range was wide and that our transmitter was the best possible for broadcasting at this time.

"We had built close-talking microphones. I call them that because they were designed for talking directly into them, thus eliminating the hum of the motors, the cabinet noises, and the sounds of others working their instruments nearby. And right here let me reveal that Charles Perrine, who handled the radio setup at the World's Fair and could talk to us at any time, told me just now that at no time could he hear engine noise in our talks. This goes for talks we had over on the other side of the world.

Officers' Own Story

As Related by

RICHARD STODDART

Radio Engineer

To CECIL CARNES

Top photo—Howard Hughes' plane taxiing down the runway at Floyd Bennett Airport in Brooklyn, N. Y., having completed a record world-circling flight in 3 days, 19 hours and 8 minutes. Left — Richard Stoddart, radio engineer, tells a radio audience about his thrilling experiences from his New York apartment.

"Of course in having this apparatus built we had to consider weight, so the materials had to be of airplane-type construction throughout. There could be no vibration, yet the instruments had to be worthy of withstanding hard usage, and the possible extra-deterioration which comes from travel up where the air is thin. Dampness and possible humidity also had to be guarded against."

Here Mr. Connor, slight, intelligent co-navigator on the flight, spoke from his background of previous spectacular flights, to point out how Mr. Stoddart's exposition of the care used in preparation for the sensational globe-girdling trip of three days, nineteen hours and eight minutes was in graphic contrast to most aviation history, even the recordings of the "carefully" planned aerial excursions. Both men explained that Mr. Hughes and their other colleagues, Thomas L. Thurlow and Edward Lund, were hard at work throughout this period, securing equipment and familiarizing themselves with it.

"The installation of the instruments occurred a few weeks before the flight," Mr. Stoddart continued. "When we took off from Burbank to come to New York for the beginning of the trip around the world we made constant tests of all our apparatus. During the radio tests I was able to report to Mr. Hughes that Point Reys station on the West Coast was being received at the same time that we were talking to Riverhead, L. I., on the East Coast. And at Wichita, Kansas, we heard Honolulu as clearly as you please. The operator there said he could hear me so well he couldn't even tell I was in an airplane. While twenty microvolts is good for a broadcast we had thirty-two in the Honolulu test. We were now pretty confident that we had the best instruments we could get and it happened to work out that way all around the world.

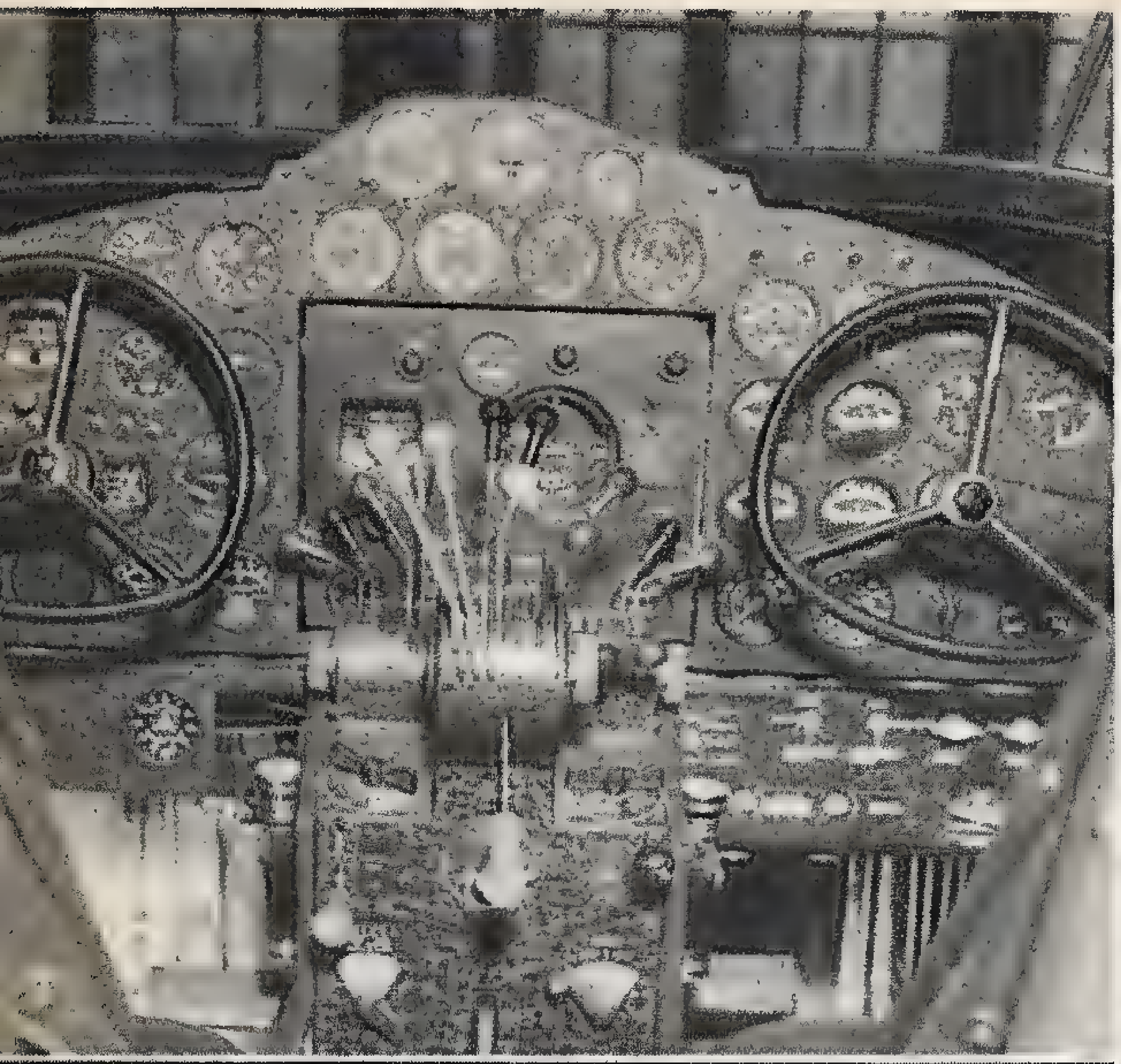
"Our only anxiety, really, was in waiting for the actual results of our many months of study and work. We were so anxious to do our best.

"As soon as we took off from New York we first called our headquarters at the World's Fair, where Mr. Lodwick was directing the work of receiving weather reports from 900 stations all over the world, having them reduced to charts and sending the data on to us. This system worked like a charm and we got the reports all the way around.

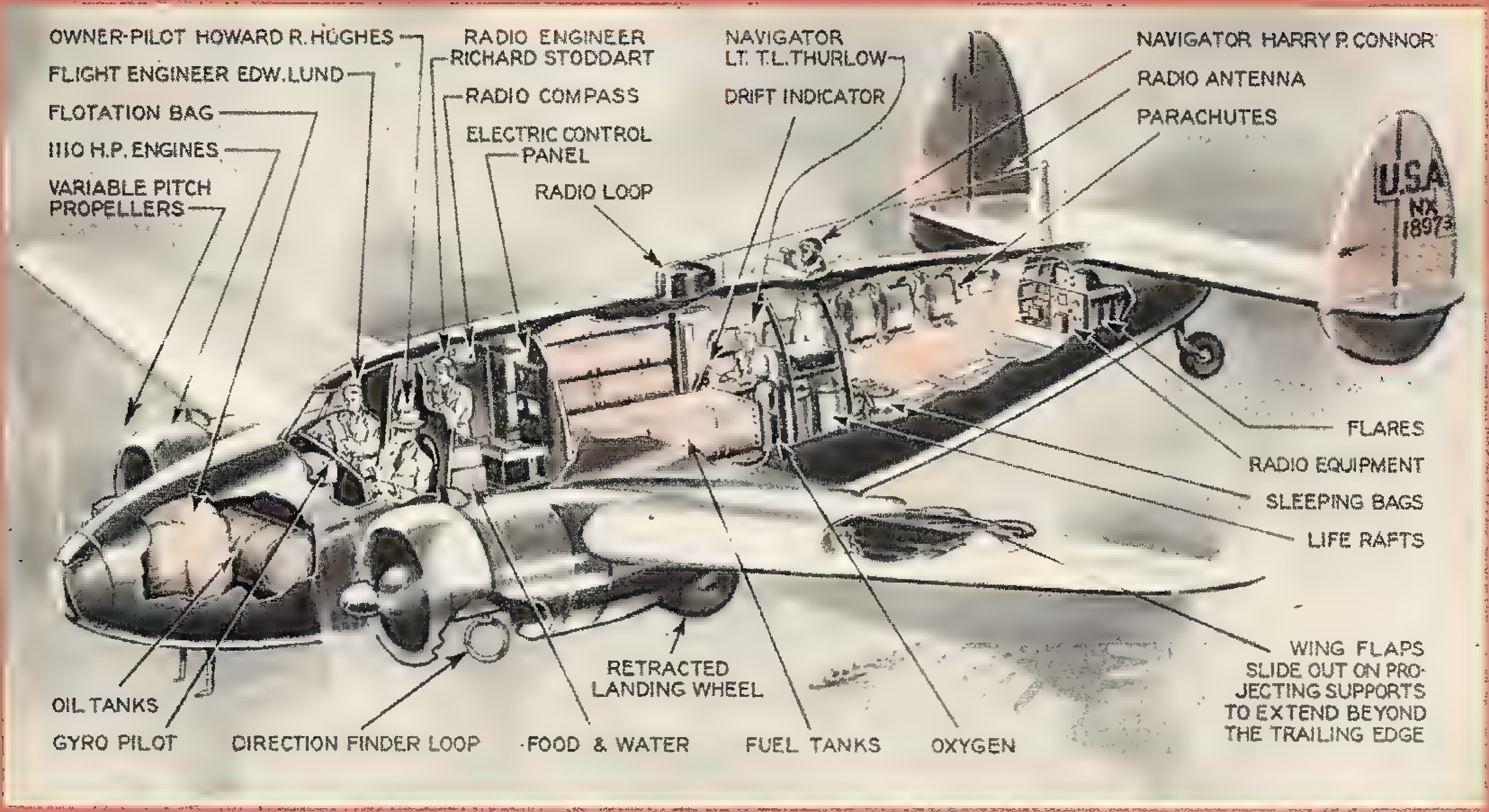
"There was never any question of not being able to 'work' the radio station at the World's Fair Grounds. When we didn't get them it was because there was too much other work to do in getting local radio stations along the route we were flying, asking for information we might need. We put out our trailing antenna as soon as we got in the air—it had a stream-lined piece of rubber on the end of it for a stablizer—and began contacting the RCA coast stations and the big outfit at Chatham, Mass.

"We lost one trailing antenna over Newfoundland on the way out. We had two such wires, but had to delay a bit in putting the other out for fear it might tangle up with whatever was left of the one which broke. We sent out, in our early messages, that things were going well and the crew was fine. Later we made a broadcast, from the ship.

"A World's Fair amateur setup, a sort of network of stations all over our course, had



Above—The instrument panel of the Hughes plane featured the latest type of scientific flying aids. Right—The navigator's compartment. It was here that the course of the plane over the entire 14,824-mile route was plotted. A new navigating device developed by the U. S. Army Air Corps was successfully tested on the lengthy trip.


OWNER-PILOT HOWARD R. HUGHES
FLIGHT ENGINEER EDW. LUND
FLOTATION BAG
1110 H.P. ENGINES
VARIABLE PITCH PROPELLERS
RADIO ENGINEER RICHARD STODDART
RADIO COMPASS
ELECTRIC CONTROL PANEL
RADIO LOOP
NAVIGATOR LT. T.L. THURLOW
DRIFT INDICATOR
NAVIGATOR HARRY P. CONNOR
RADIO ANTENNA
PARACHUTES
USA
NX 18973
FLARES
RADIO EQUIPMENT
SLEEPING BAGS
LIFE RAFTS
WING FLAPS SLIDE OUT ON PROJECTING SUPPORTS TO EXTEND BEYOND THE TRAILING EDGE
OIL TANKS
GYRO PILOT
DIRECTION FINDER LOOP
RETRACTED LANDING WHEEL
FOOD & WATER
FUEL TANKS
OXYGEN

This cut-away perspective drawing shows how the space aboard the world-circling plane was utilized.

been arranged before the take-off and special frequencies had been assigned for re-broadcasting programs. We got wonderful cooperation from all over the world. We were deluged with calls and my only regret was that I didn't have time to talk to them all."

Mr. Connor laughed at this time and said everything worked like a well-oiled clock.

"There wasn't much time for joking at all," he said, "and we never had to change our course from the original one set for Paris. There was steady work to do and no one had time to sleep, but Mr. Thurlow and I could alternate on our jobs, and that relieved us quite a bit. Poor Dick had to work right along.

"We all wore our ordinary street clothes. There wasn't much to see. For instance we didn't even see water until we were within two hours of Ireland. But we hit just the right little part of The Emerald Isle, and there wasn't a minute that we didn't know where we were.

"There was plenty of food on board," Mr. Stoddart said, "but we didn't eat much at first, just drinking milk and picking at things. We carried New York spring water clear around the world and still had our stainless steel tanks, which we had kept full of water for an emergency, just as full when we landed back at New York. We also had all sorts of canned foods and bottled water was given us at each stop.

"We were ready for any emergency which might have happened enroute. Our individual parachutes were hanging along the cabin walls. There was a flotation gear on the ship and we carried a complete rubber boat which would inflate itself. All you had to do was release a valve and a special compressed gas would do the rest.

"There were guns, fishing tackle and emergency radio instruments available. Our main transmitter was up forward in the ship. Our remote control equipment was all over the plane, but we had one central panel for operation. There was another transmitter and another receiver of the same make in the tail of the ship. Our receiving aerials were fixed on the top and bottom of the fuselage, and so we could always receive messages.

"As we came down at Paris we were two hours ahead of schedule, and therefore the crowd wasn't terrifically large, but it was a happy one. We knew there would be five or six hours before we took off again, so we determined to get a good sleep. This we did, right at the field. We slept for two hours or maybe a little more, and it was the only time we had our shirts off on the whole flight.

"A frame in a tail member had buckled, slightly, and Mr. Hughes decided to have it re-inforced. We might have been able to go on with it the way it was, and anyone else

[*Continued on page* 59]

World's Biggest Man-Made Lake

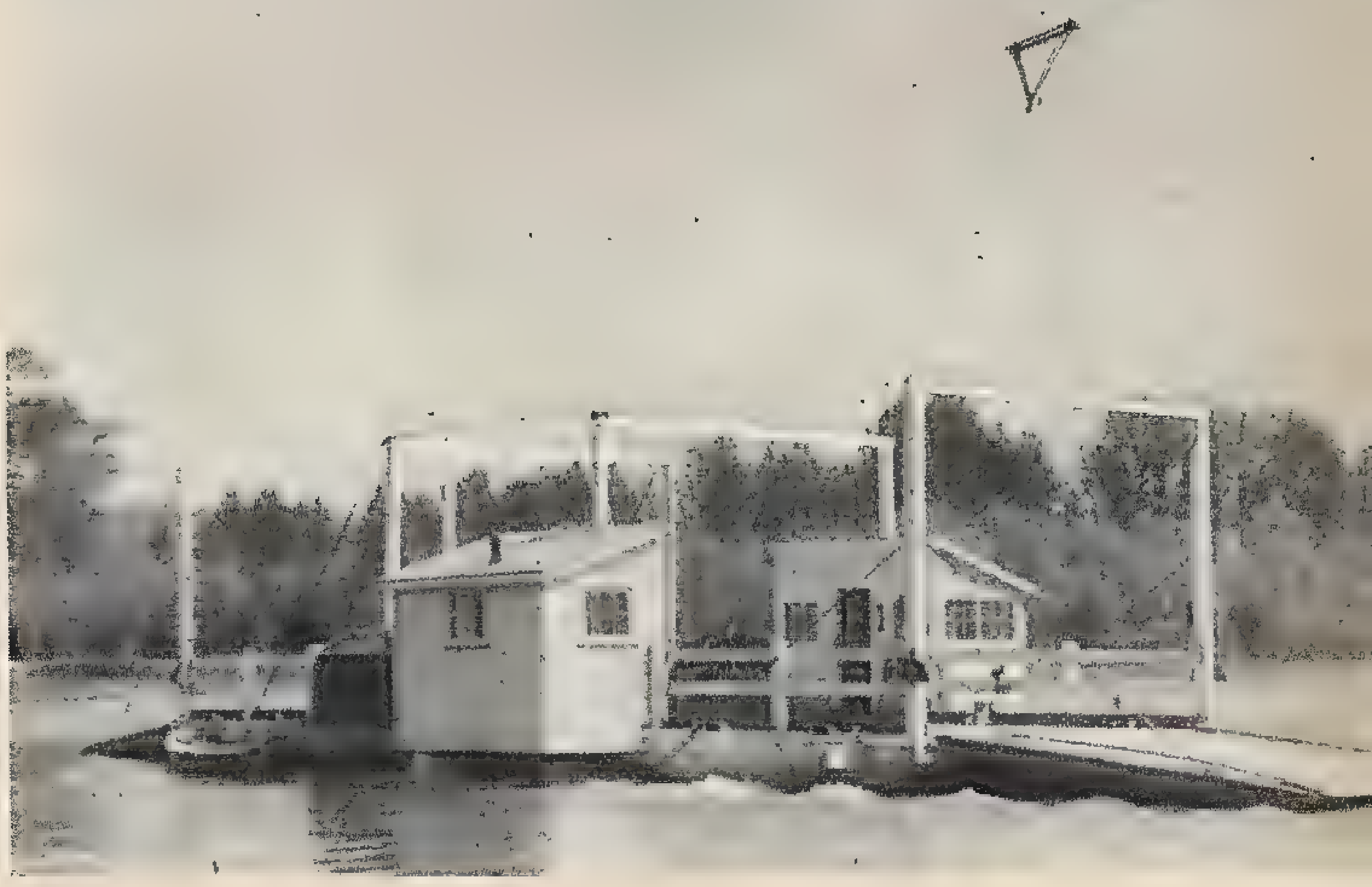
BOULDER Dam (opposite page), constructed by the Bureau of Reclamation in the Black Canyon of the Colorado River, has created the biggest man-made lake in the world. Storing 20,000,000 acre-feet of water, sufficient to provide 51,100 gallons for every man, woman and child in the country, and supplying the needs of the great power house at the toe of the dam as well as irrigating about 1,000,000 acres of reclaimed desert in Arizona and California, the dam represents an expenditure of about 115 million dollars and five years labor by a crew of workmen numbering 4,500.

Construction of the dam itself was started in 1930 and completed in 1935, but installation of the machinery for the power house will still require a few years before the plant is fully equipped. Five generators are now installed, two additional generators are almost ready for operation and two others are being manufactured. The output of the power house at this time is approximately 112 million kilowatt hours per month. When fully completed, the power house will have a capacity of 1,835,000 horsepower.

The dam is the highest in the world, rising to a height of 726 feet above bedrock, and is capable of raising the water level of the Colorado River 582 feet. Its length along the crest is 1,232 feet and a total of 3,420,000 cubic yards of concrete was used in the construction of the dam and its appurtenant works. The reservoir formed by the dam is called Lake Mead, named for Dr. Elwood Mead, Commissioner of Reclamation during the construction period, who died January 26, 1936. Projects are now under way which will add about 600,000 acres to irrigation areas below the dam when completed.

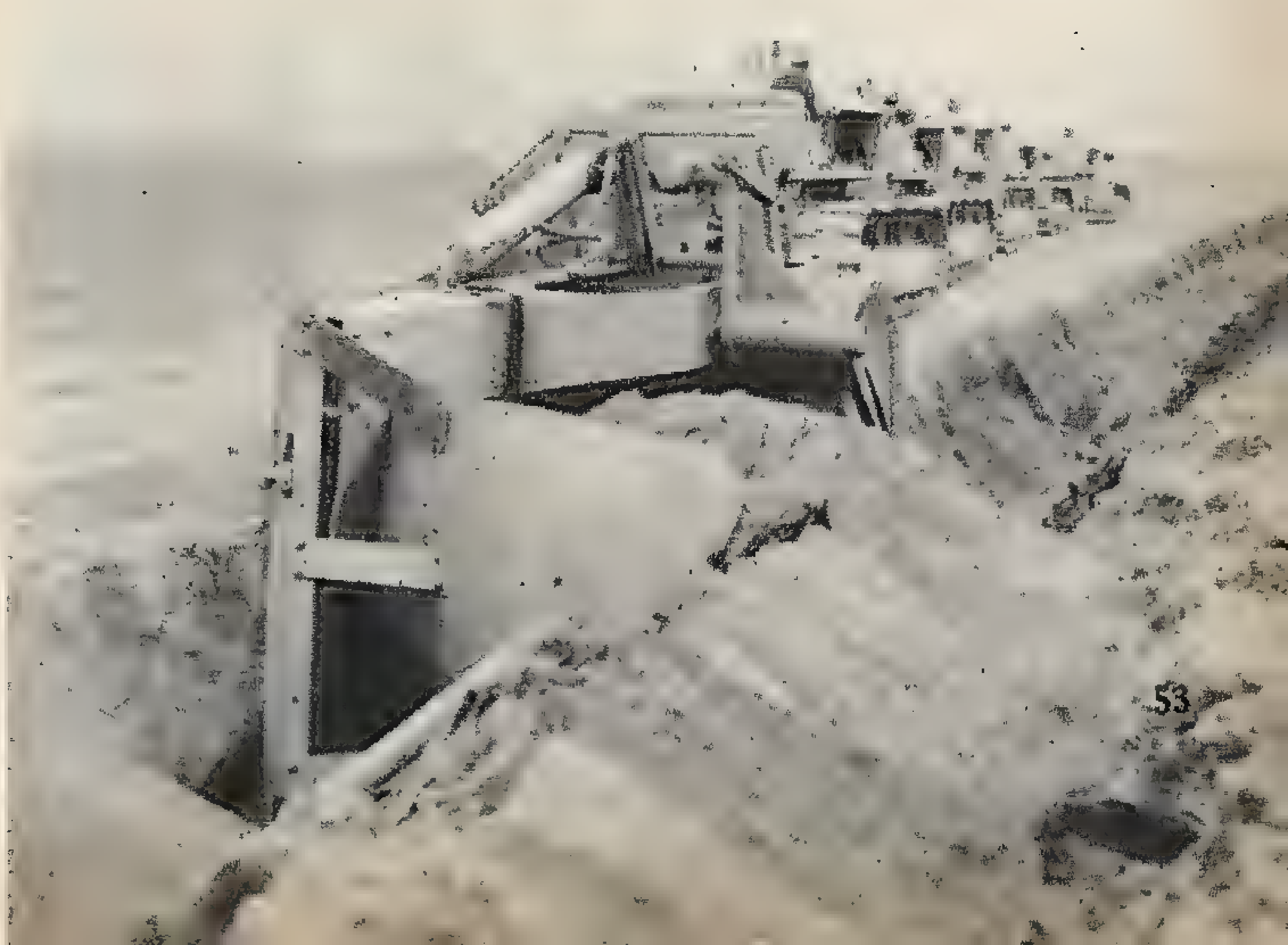
Novel Ferry Operates Like Trolley Car

A NOVEL automobile and passenger ferry operating on the Willamette River, between Independence and East Independence in Oregon, receives electric power for its motors from an overhead trolley, as shown in photo, and is propelled by paddle wheels housed in small control cabins. Each paddle wheel is 7½ feet in diameter and is geared independently to a 10-horsepower motor to facilitate ease of operation. Paddle wheel operation is necessary due to the river's shallowness.



Mammoth Plow Digs Six-Foot Furrow

WEIGHING ten tons and pulled by five diesel-powered tractors developing 400 horsepower on the drawbar, a huge single-bladed plow developed for use in farming land which has been coated with river sand, due to floods, creates a furrow six feet deep to bring the rich soil to the surface again.



Millions From Mercury

The search is on for Cinnabar, that red-streaked quartz ore from which mercury is distilled, to appease the demands of war and industry. If you have a prospectin' yen for mercury, here's how!

by B. Ruskauff and D. Rosier

Cinnabar is frequently mined above ground; digging it is comparatively easy on miners.

IF YOU like prospecting, here's a tip. Oil up the boots and roam the hillsides along the Pacific Coast range. Keep your eyes peeled for cinnabar, the easily-distinguished, red-streaked quartz ore from which mercury is "distilled." There have been great mines there; engineers believe there may be again. You strike it lucky and there are two advantages—the price trend is upward and mercury is the easiest and least expensive of all metals to extract from the quartz. Costly machinery isn't essential to convert cinnabar into cash. The little fellow still has a chance at big profit.

The world today is mad about mercury. Why? Startling, but true, is the fact that in industrial progress, as in war, the possession of mercury or the lack of it, may decide the future of many nations.

Because of its versatility and strange affinity for other metals, quicksilver today plays a stellar role in more than a thousand peace-time uses. In few cases can any other metal be substituted for it. And, as no other metal, mercury runs through the entire field of our industrial, chemical and medical civilization.

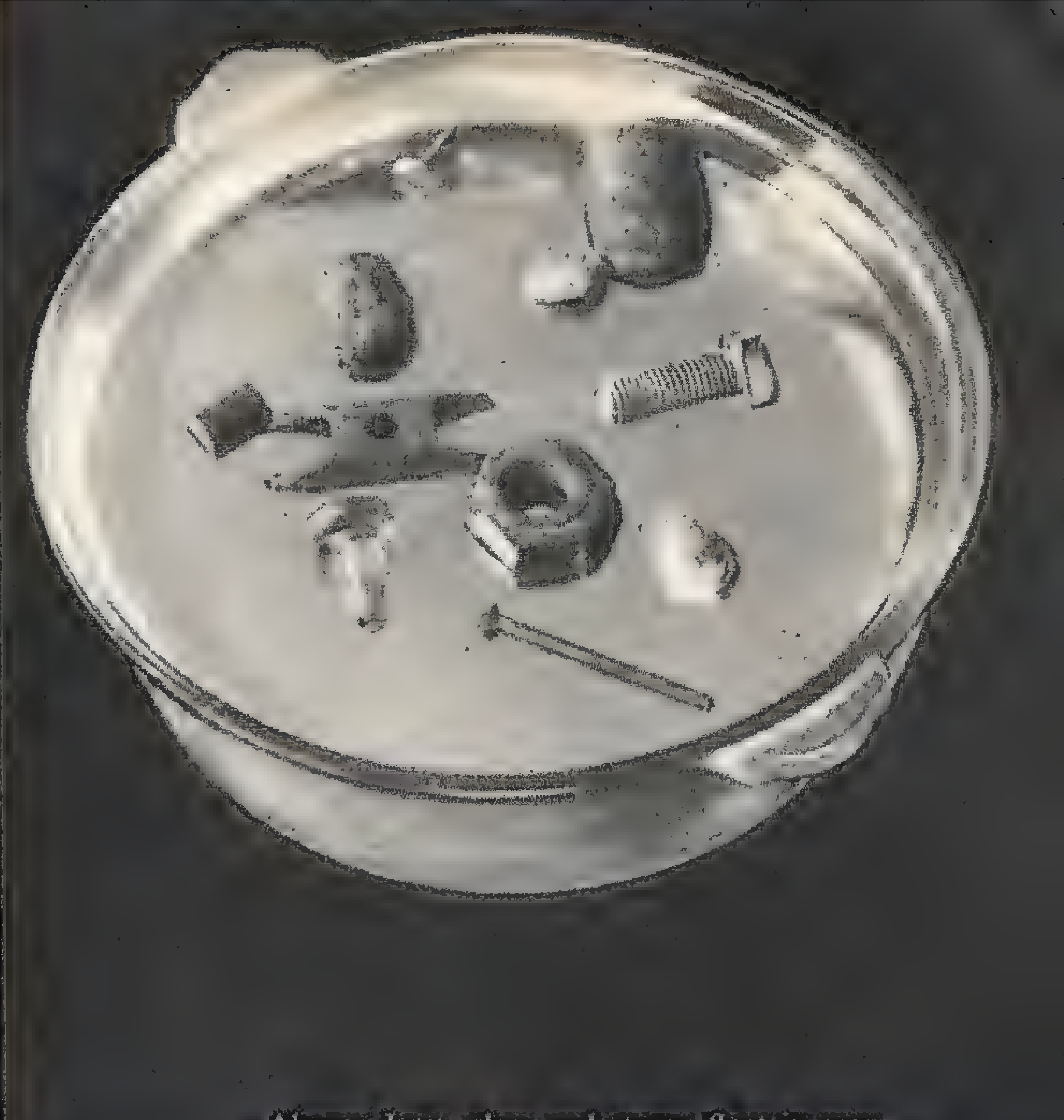
Because mercury fulminate is the most dependable detonating agent known, mercury stands as a primary war metal. The deadly regularity with which big guns rumble, machine guns rat-a-tat and bombs explode is due to the fulminate contained in the little detonating cap, which explodes under shock to ignite the charge. Without mercury no modern war could be waged.

The United States is the third largest producer of mercury, though in recent years we have not produced more than half enough to meet our ordinary needs and the industrial uses are constantly expanding. With a few exceptions our deposits are usually small and not extremely rich. But in the hands of many small operators these mines, with prices soaring, are yielding inspiring returns to their owners.

At one time, the third greatest mercury mine of the world was New Almaden in California. Most of us are familiar with the name and know that it was once a great mine, but few realize that it figured importantly in the history of early California, or that it gave up more than $150,000,000 worth of metal before it was finally abandoned.

One of the richest new cinnabar strikes, in the Santa Clara Valley, came about largely

Mercury is shipped in these containers holding 76 pounds. This is a universal standard.



Above: Iron, glass and stones float in mercury. Below: Crushing ore before cooking.

because of the faith of an old Cornish miner from New Almaden. For years he maintained that cinnabar would crop out again not many miles from the old great chimneys. Prospectors and geologists, finding scattered bits of quartz, were inclined to agree with him.

The developers of this new mine are just ordinary fellows, prospectors by avocation. Bronzed Lewis Purinton is in the roofing business. He explained:

"Guess I've always liked prospecting. Done a lot of it. And whenever business was slow, I'd be out at it again. Funny thing is that I've been all over California, but made my big strike close to home. Which shows that you never can tell."

They are opening up a rich vein of red-flecked ore about six feet wide and 300 feet deep which, if it continues as geologists think, holds a fortune for the finders.

The hillside where the recent strike occurred gave such good indications that one company, several years ago, went so far as to spend several thousand dollars in tunneling and erecting a furnace. Failing to find the rich ore vein which really was there, they gave up, believe it or not, when they were within a few feet of discovery.

Although New Almaden was shut down in 1926, small operators are still extracting some mercury from the old dumps. Every day, eight to ten tons of loose dirt are run through a little power sluicer, where the heavier quartz drops into a bin while the rest is washed away. This amounts all the way from $20 to $100.

At New Idria, Calif., however, there is renewed, large-scale activity. Ex-President Hoover and his brother have bought the properties and installed vast machinery of the most modern type. Four great rotary furnaces and twelve condensing tubes will cook ore brought by electric locomotives from 200 miles of shafts and tunnels.

California, with between 50 and 100 small mines, now produces 92% of the mercury recovered in this country. Nevada is next and Oregon third. Many think the next big strike will be in Oregon. But mercury, like gold, is where you find it—and you may find it anywhere. Cinnabar is freakish. One vein looks as rich as Croesus. The owner's head swims, he counts in millions; then he wakes to find his vein pinched out. Another follows an unlikely stringer, about to give up, when it leads into a rich chimney and he really is set for a nice, tidy little fortune.

Cinnabar ore is crushed and then "cooked" in open air furnaces. A stoker is removing slag from a reducing furnace at the right. The cloth over his face is to protect him from mercury fumes. After the ore is cooked, mercury vaporizes and is condensed in the huge tubes shown above, after which it is recovered and bottled for shipment.

Our most productive small mines are located in Napa and Lake Counties, and there are others in the Santa Lucia Range back of San Luis Obispo. Interesting to note, the patent for the Oceanic, five miles from Cambria, was signed by President Lincoln in 1865.

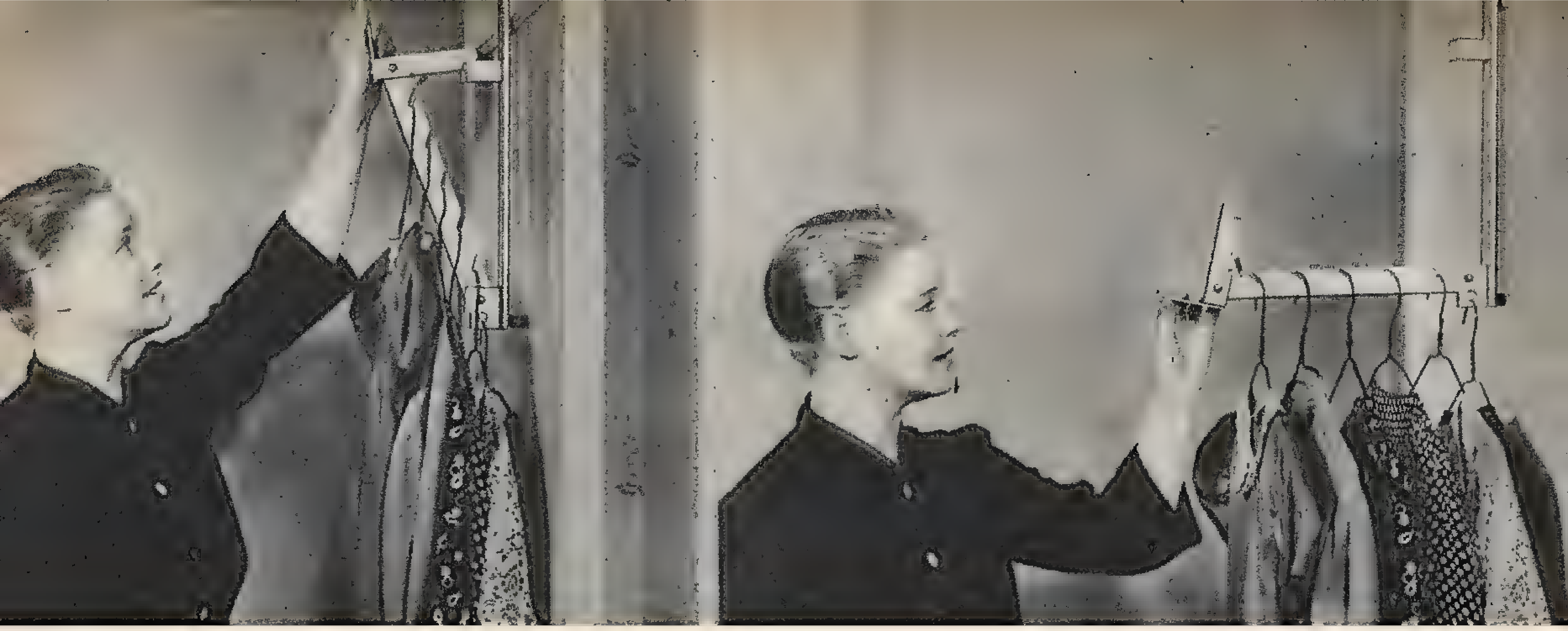
The name "quicksilver" describes the metal. It is both silvery and quick-running. The only one which takes the liquid form at ordinary temperatures, it has other interesting characteristics. Almost 14 times heavier than water, its weight is so dense that iron floats on it as easily as wood on water. It might be termed a "friendly" metal, for it forms a long list of compounds and amalgams with other chemicals and metals.

The method of recovering mercury from the ore is really one of distillation, virtually the same as discovered by the ancient Greeks. In fact it is much the same as that by which "Kentucky moonshine" is produced. The ore at the mine is first blasted, then broken into chunks. These are crushed, or "fined," and then fed into huge cylindrical ovens. As soon as the temperature reaches 360 degrees Fahr., the mercury begins to vaporize and at 600 degrees Fahr., the bulk of it has converted to a gaseous state. This vapor is passed next through long, cylindrical condensers which look much like the pipes of an enormous pipe organ. In cooling it takes its final form and trickles out into big iron kettles as a pure, silvery-appearing liquid metal. The slag is passed out the fire end of the furnace.

In today's larger mines, huge rotary furnaces are used, operated under a 1,500-degree flame heat. Most recent development is the Gould rotary. This is a big drum, 60-feet long by five-foot diameter, which revolves slowly as from 30 to 50 tons of crushed ore is heated at one time. But in the "one-horse" mines, many a home-made oven is in comparatively efficient operation, "cooking" several hundred pounds of ore at a time. The

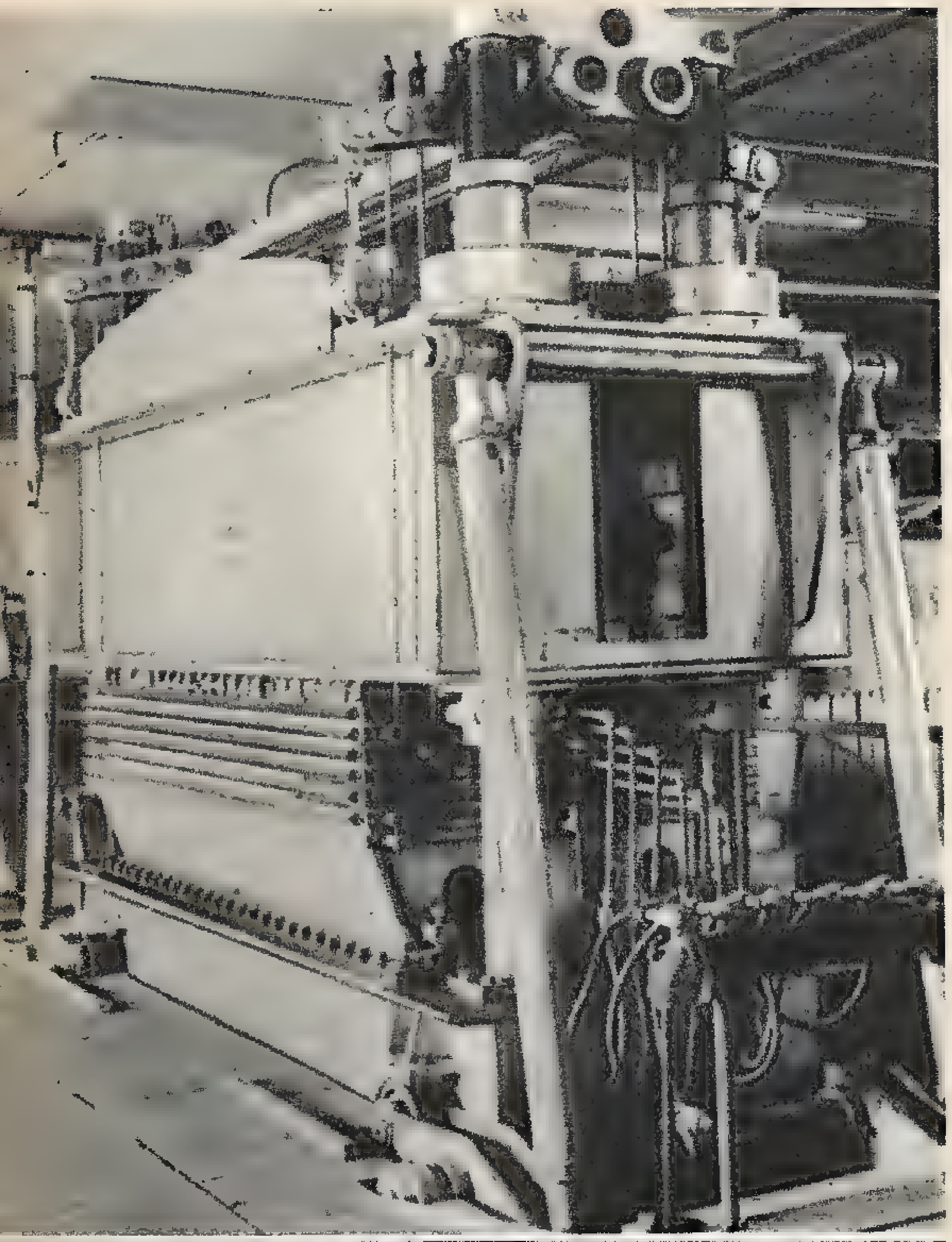
[*Continued on page* 69]

Mercury is one of the few known metals that may be handled cold in liquid form. Note that it doesn't spread and that it isn't easily soluble. A commercial application of mercury is illustrated above which shows an experimental power house using mercury vapor instead of water to produce steam. Sections of the boiler are visible.



Hanger Device Supports Six Garments In Small Space

EASILY mounted on any type of door or wall, a newly developed metal hanger device enables six garments to be hung flat against each other in a minimum space. The device features a swinging arm grooved to accommodate six ordinary clothing hangers. When the arm is raised, the garments are held flat in an out of the way position. A catch lock prevents the arm from falling.



Process Improves Veneers

A NEW process for applying veneers to wood, which will permanently prevent warping, splitting and checking, has recently been developed. The process involves the use of a gigantic hot-plate press (left) and a new liquid resin glue. Veneers applied by the process are so firm that a tug-of-war between two five-man teams pulling ropes attached to a sample panel failed to dislodge the veneer (below).

Hughes Officers' Own Story Of Record Flight

[*Continued from page* 51]

might have been tempted to do it, but he never left anything to chance and the whole world now knows how right he was.

"Let me just explain a bit about the interesting work we carried out in triangulation. Before coming to Ireland we went down into the low frequencies and took radio bearings on the various ships in our vicinity. There must have been ten that answered our general call. Bearings were taken from them, since they would give their direction, latitude and longitude, speed and the time of their position recording. They would send out their signal and then our direction-finding loop would be rotated until the direction finding indicator showed the number of degrees the ship was bearing away from us.

"We illustrated the success of our homing device on the trip over to Omsk, and in many other places. We used the visual type of direction finder. We would pick up a station and turn our loop at right angles to the station we were listening to. The indicator would then point the course, and if we changed the needle would show which way we were swinging away from the station. If we were going left of it, the needle would point left. As a homing device, we left the loop at right angles to the nose of the plane and just zoomed in.

"We didn't seem to notice how the time passed, because all of us were doing our jobs pretty steadily and, before we knew it, we were coming in to the field at Yakutsk, where there was fine weather. It was warm enough to go around with your shirt sleeves rolled up. While the ship was being refueled the sun dropped down below the horizon, but when we took off and climbed to a few thousand feet, there was the sun again and it never disappeared all the while we streaked across to Fairbanks, Alaska.

"When we got down at Fairbanks there was a nice crowd of several hundred people waiting to greet us. It was nice and warm there. A lot of spare radio parts, which we had carried 'just in case' were dropped off there and in a little while we were off again, headed for Minneapolis, Minn.

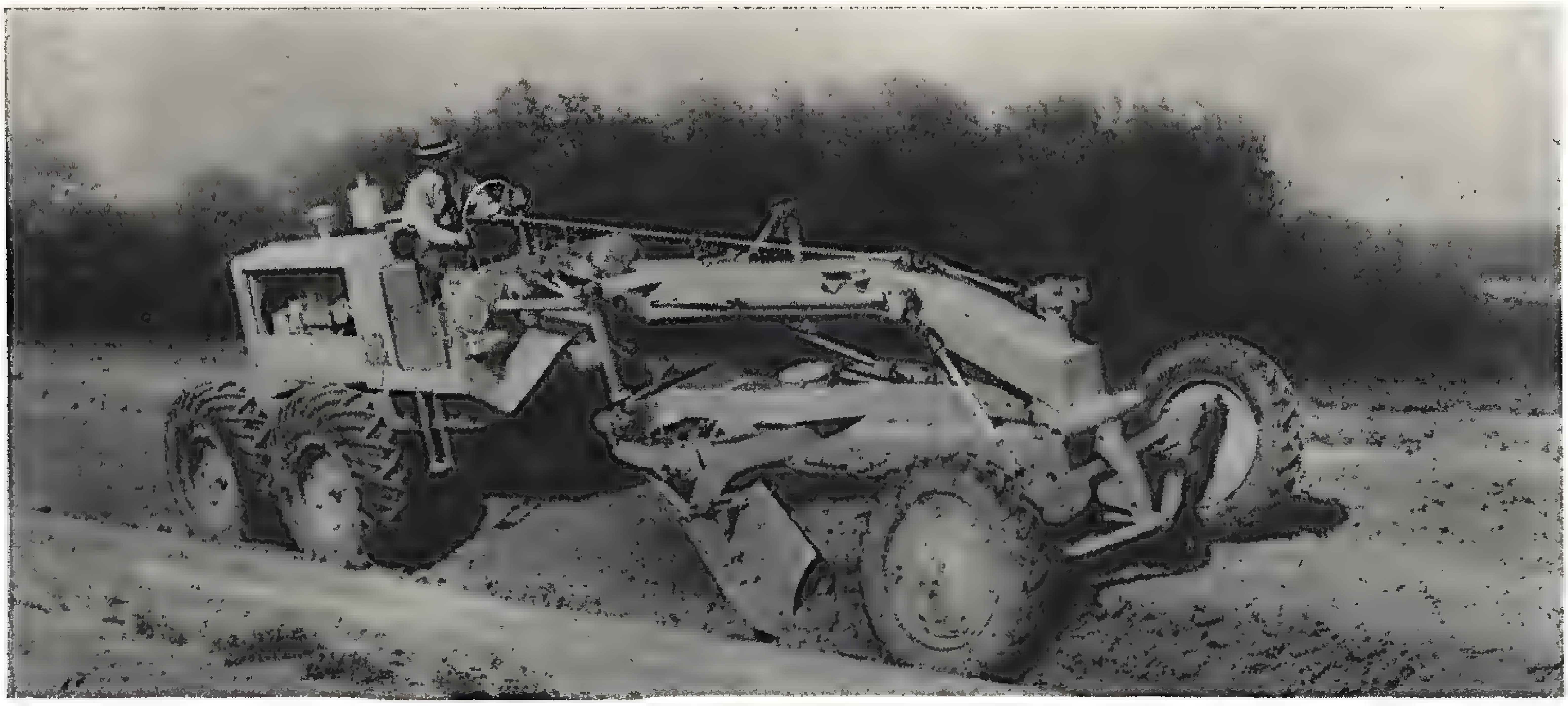
"We were awfully sorry that we couldn't have touched Canadian soil somewhere, but it just happened that when we got to the point where a decision had to be made, things were going fine, we had a favorable wind and enough gas, so Mr. Hughes decided it would be better to go an additional 400 miles or so to Minneapolis, gas up quickly, and take off again for New York.

"Naturally on a long flight like that there was a lot of turbulent air, and there were times when it was pretty bumpy. But as we sped along at about four miles a minute, towards New York and the end of our flight, I was thinking of how everyone along the way had tried to help, how the radio man on the Coast Guard boat, Northland, off Teller, Alaska, had been anxious to help, and how the Coast Guard supplied us with complete weather reports from Dawson to Winnipeg. I was still thinking about that fine spirit everyone had shown when we touched wheels again at Floyd Bennett Field, New York, and the flight was over. And I guess I, and all the other boys, am going to have some nice thoughts about that same spirit of helpfulness for a long time to come."

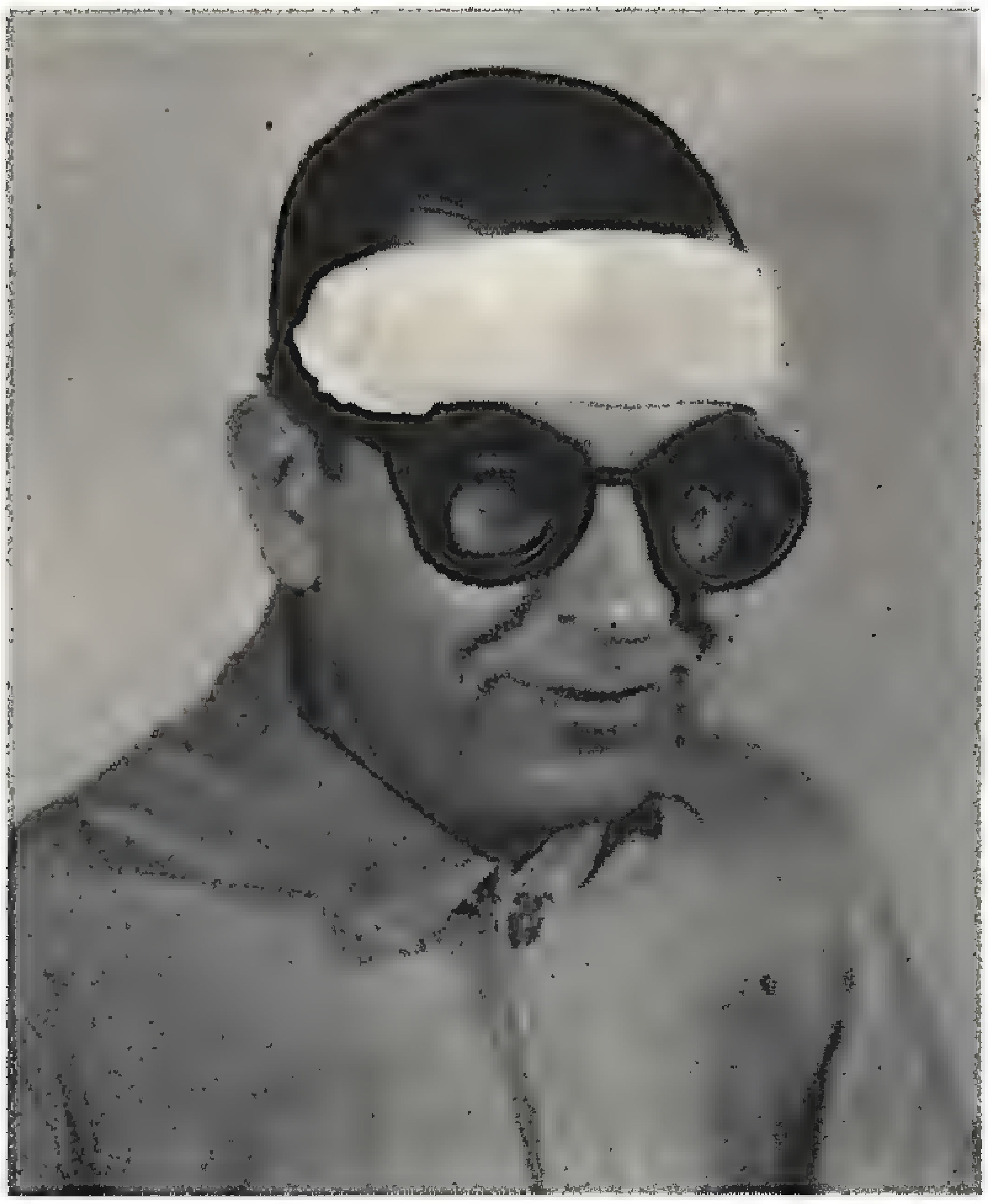
Machine Handles 40 Woodworking Jobs

CAPABLE of forty different woodworking operations, being a combination of saw table, jointer, band saw, lathe, shaper, mortiser and sander, a newly developed workshop machine is operated by a single motor and can be changed from one operation to another in less than half a minute. The machine operates by plugging into an electric light circuit. The various working parts are properly guarded and, due to the machine's rigid cast iron frame, are always in exact working alignment.

Road Grading Machine Features Rotatable Blade

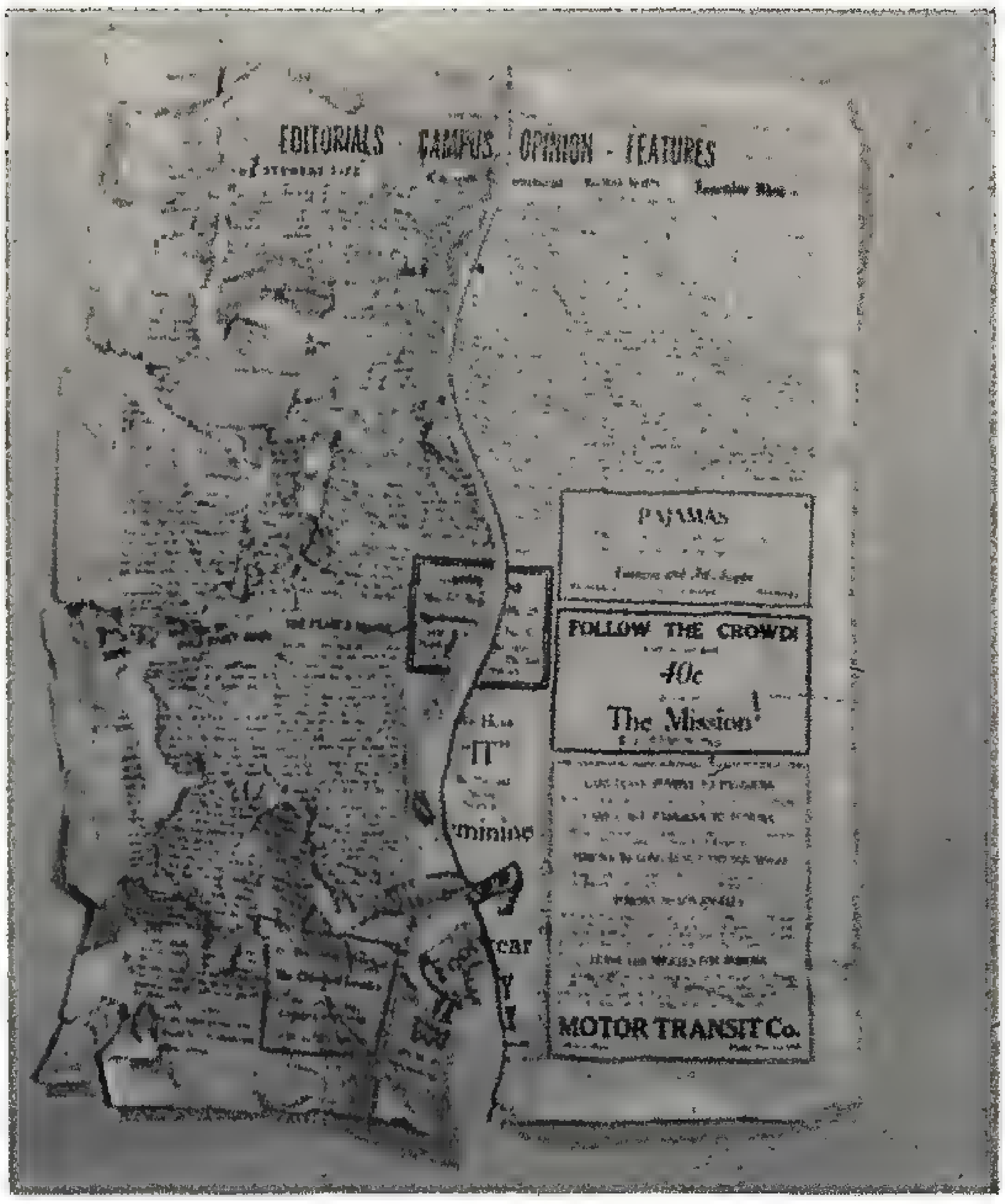


POWERED by a 66-horsepower diesel engine, a newly developed road grading machine features a blade which can be turned completely around, providing a means of working short stretches where turning of the machine would be difficult. The transmission offers six forward and two reverse speeds with a range of from 1.8 m.p.h. to 15.2 m.p.h.



Sweat Band Helps Workers

A SWEAT band designed for use by workers who wear goggles is said to thoroughly absorb forehead perspiration, preventing clouding of the goggles and keeping the workman's eyes clear. The band consists of a cellulose pad covered with high-grade absorbent gauze.



Process Rejuvenates Paper

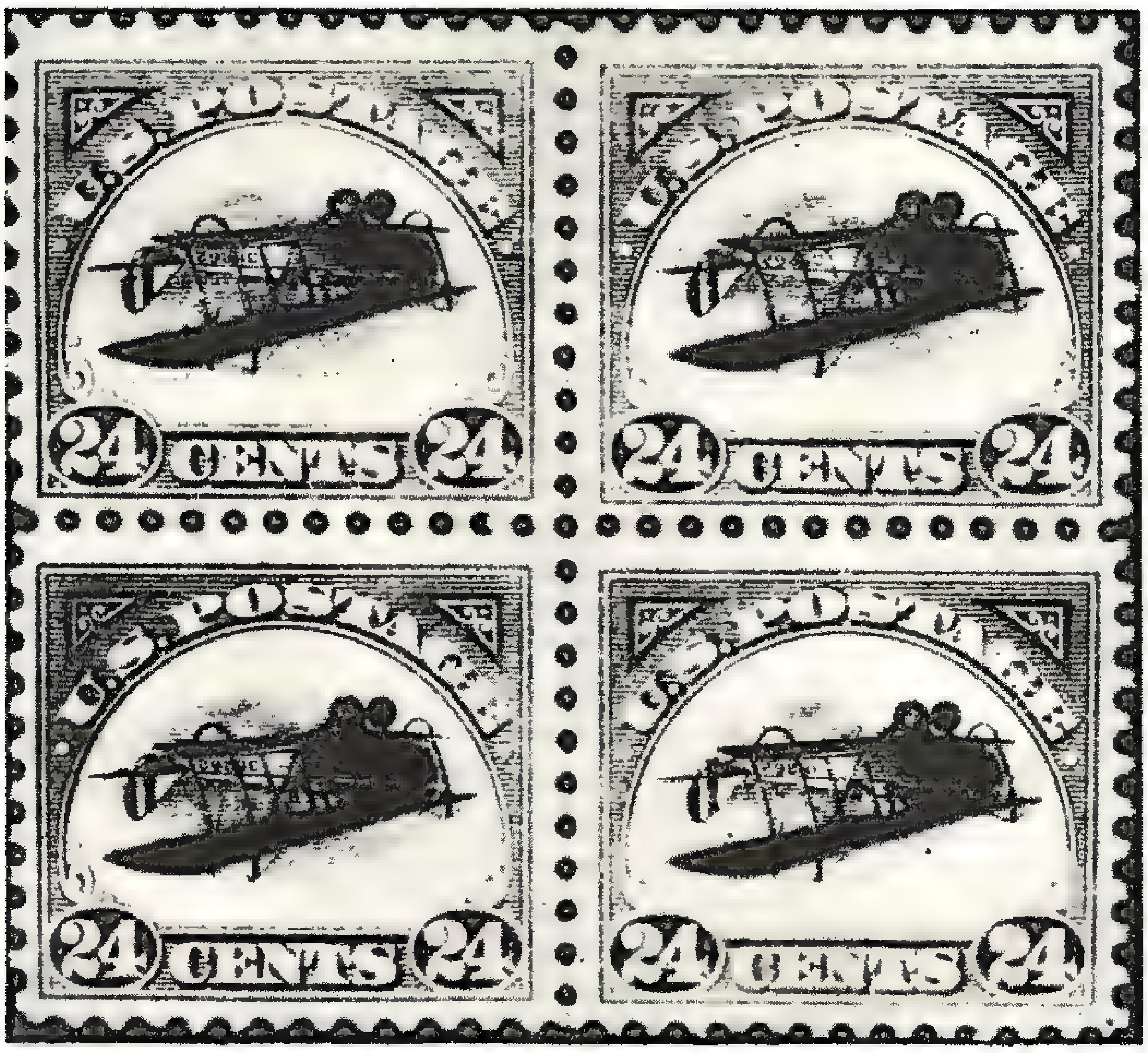
A SECRET chemical process for rejuvenating old paper has been developed by Jerome D. Laudermilk, a research associate at Pomona College, Claremont, Calif. The photo above shows an old newspaper, the right half of which was rejuvenated from a brittle condition (left half) caused by age.

Compressed Tin Cans Used To Pave Roads

A NOVEL use for old tin cans has been developed by W. H. Weaver, city engineer of Decatur, Ga. The cans are dumped on local dirt roads, compressed into a mass by a steam roller and then covered with coarse top soil. The resultant "paving" is said to be very satisfactory.

Four Air Mail Stamps Valued At $16,000

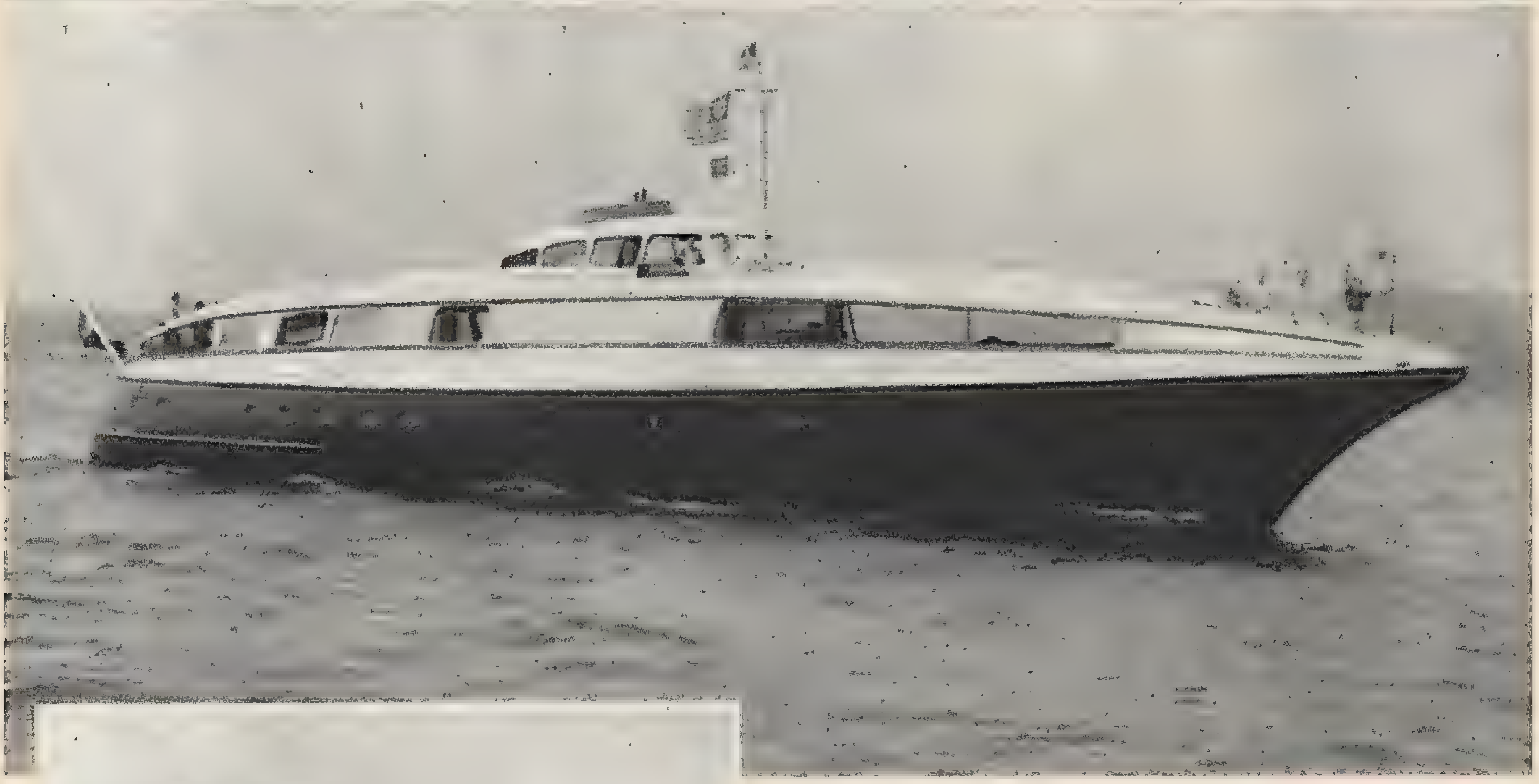
THE photograph at the right shows four of the most valuable stamps in the United States. Valued at $16,000, they are part of the first issue of air mail stamps which, because the printer erred and printed them with the "Jenny" airplane upside down, became valuable as a collectors' item. A keen-eyed post office clerk detected the error when the stamps were issued, but not before William E. Robey, of Washington, D. C., purchased the first sheet of 100 stamps for their face value of $24.



Marking Paint Made In Pencil Form

A NEWLY developed paint, which is supplied in pencil form, can be used to mark stone, glass, woods, metal and celluloid. The markings made by the pencil are permanent and can be applied to hot or cold surfaces in any weather, even during a rainstorm. The paint pencil is made in two forms, one for cold surfaces and the other for hot metals of temperatures up to 1,400 degrees Fahrenheit. When applied to hot metals, the paint will not run or burn, the marks being perfectly legible.

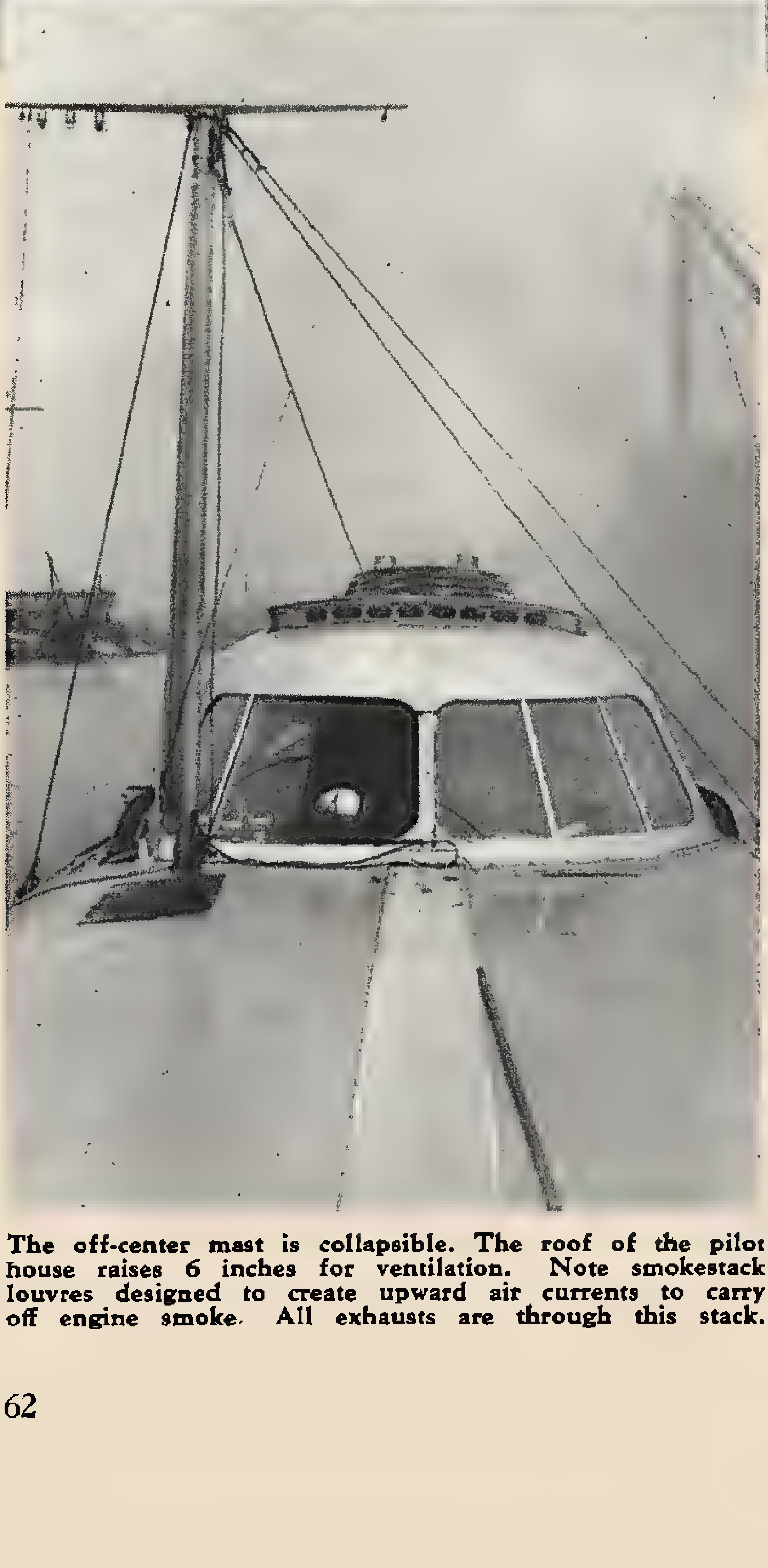
Fokker's "Q. E. D."



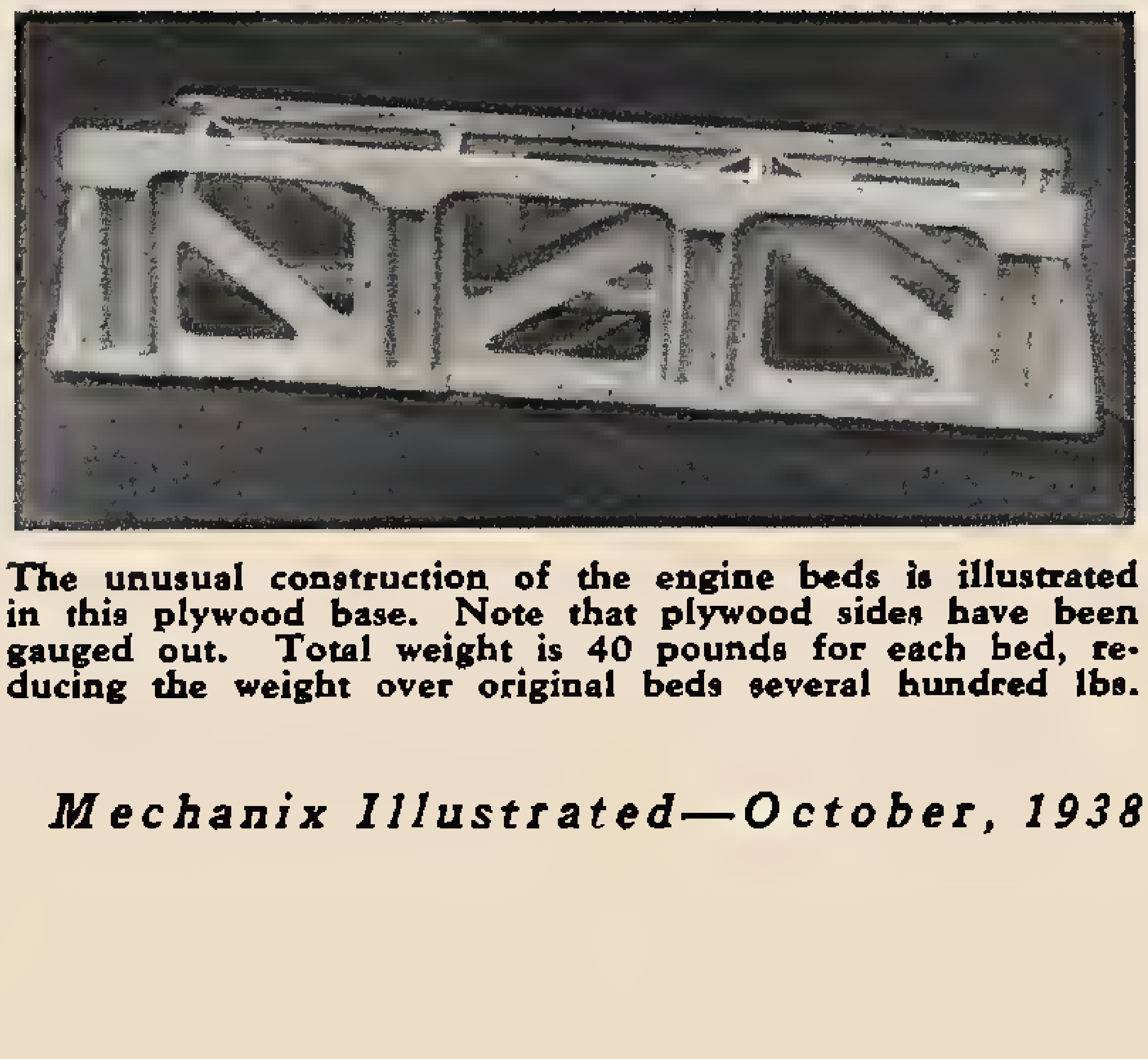
Above: The Q.E.D. afloat typifies advanced design in boat building. Its length is 110 feet. Beam measures 18 feet.

"I'VE just built the Q.E.D., a 110-foot pleasure craft with an 18-foot beam, and boat designers tell me I'm crazy," says Anthony G. Fokker, of airplane fame. "The know-alls wag their heads and say that the Q.E.D. is too radical in design. In appearance there is nothing like it, nor in construction, either. But the boat is not radical in design. I may build another boat—and when I do, designers will have something to talk about."

The hull of the Q.E.D. is built of white oak planking. The superstructure, pilot house and interior partitions are of plywood. Plywood beams have been gauged out to reduce weight. The boat has a 4½-foot draft



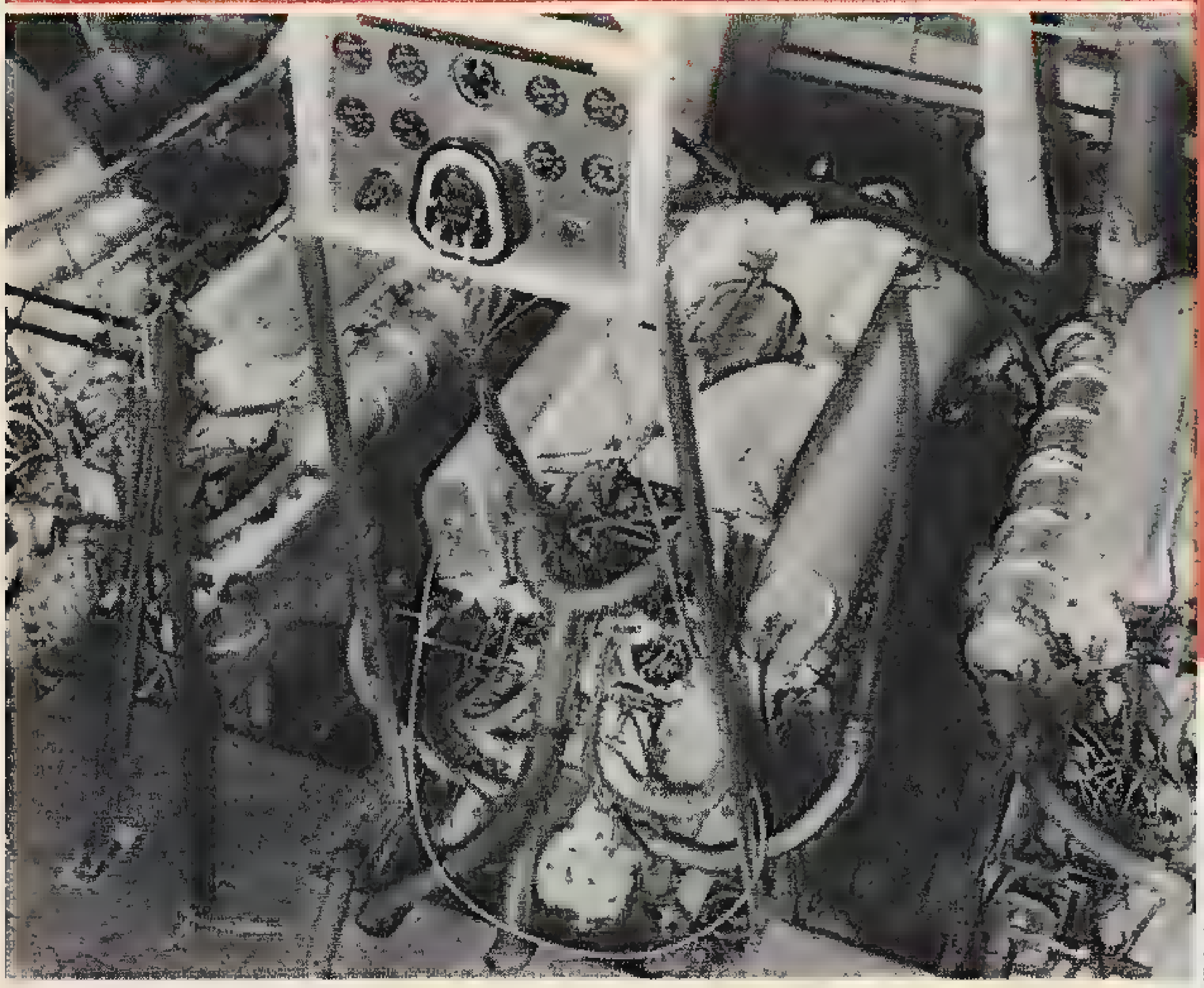
The off-center mast is collapsible. The roof of the pilot house raises 6 inches for ventilation. Note smokestack louvres designed to create upward air currents to carry off engine smoke. All exhausts are through this stack.



The unusual construction of the engine beds is illustrated in this plywood base. Note that plywood sides have been gauged out. Total weight is 40 pounds for each bed, reducing the weight over original beds several hundred lbs.

Has Queer Design

Famed airplane builder designs a streamlined boat using plywood for structural strength and separate power plants for speed and cruising.



The engine room of the Q.E.D. is all engine. The center one is an 800 hp. diesel. End ones are 600 hp. Capitol engines.

and a cruising speed of about 16 knots. Power is supplied by a Vimalert oil engine developing 800 hp. at 2,100 r.p.m. Two Capitol-Wright engines, later to be replaced by Wright airplane engines, will give a maximum speed of 35 knots. Engines are rubber mounted on light plywood frames. A V8 engine will supply power for auxiliary purposes.

The pilot house is equipped with electric controls coupled for remote control. Roof of the house may be raised for ventilation. A trap in the roof over the covered boat deck may be raised for loading purposes.

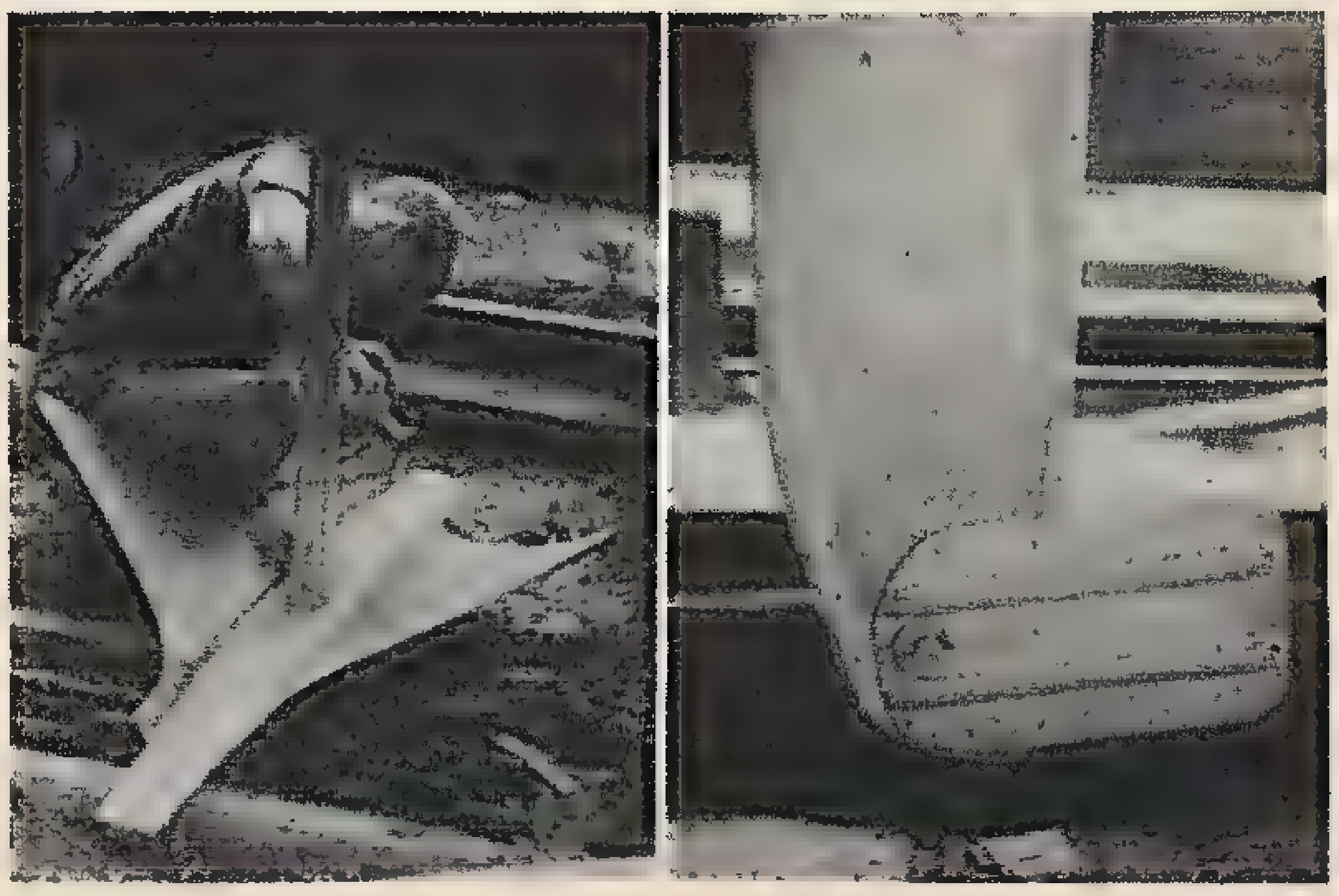
The Q.E.D. is equipped with two cabins fore and two aft, a library and stateroom, and has crew's quarters for six.

The boat has an off-center mast that is collapsible, an automatic pilot and compass, special stabilizer and anchor. No smokestack protrudes above the pilot house. A ring of louvres extending a foot above the roof will direct the air current upwards, carrying the engine exhaust with it.

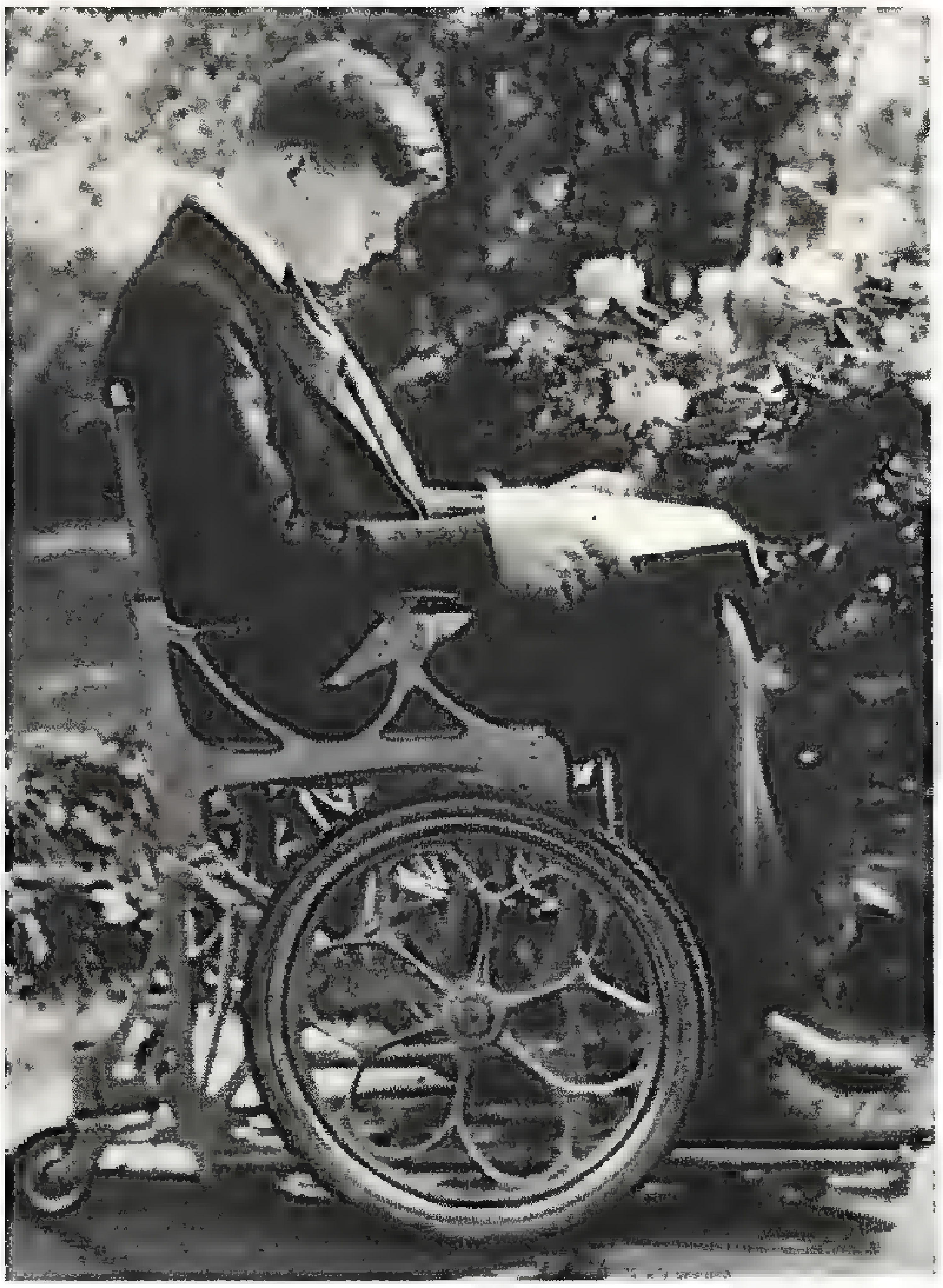
The crusier was designed for comfort, utility, and economy. Tests runs have resulted in only slight changes here and there.

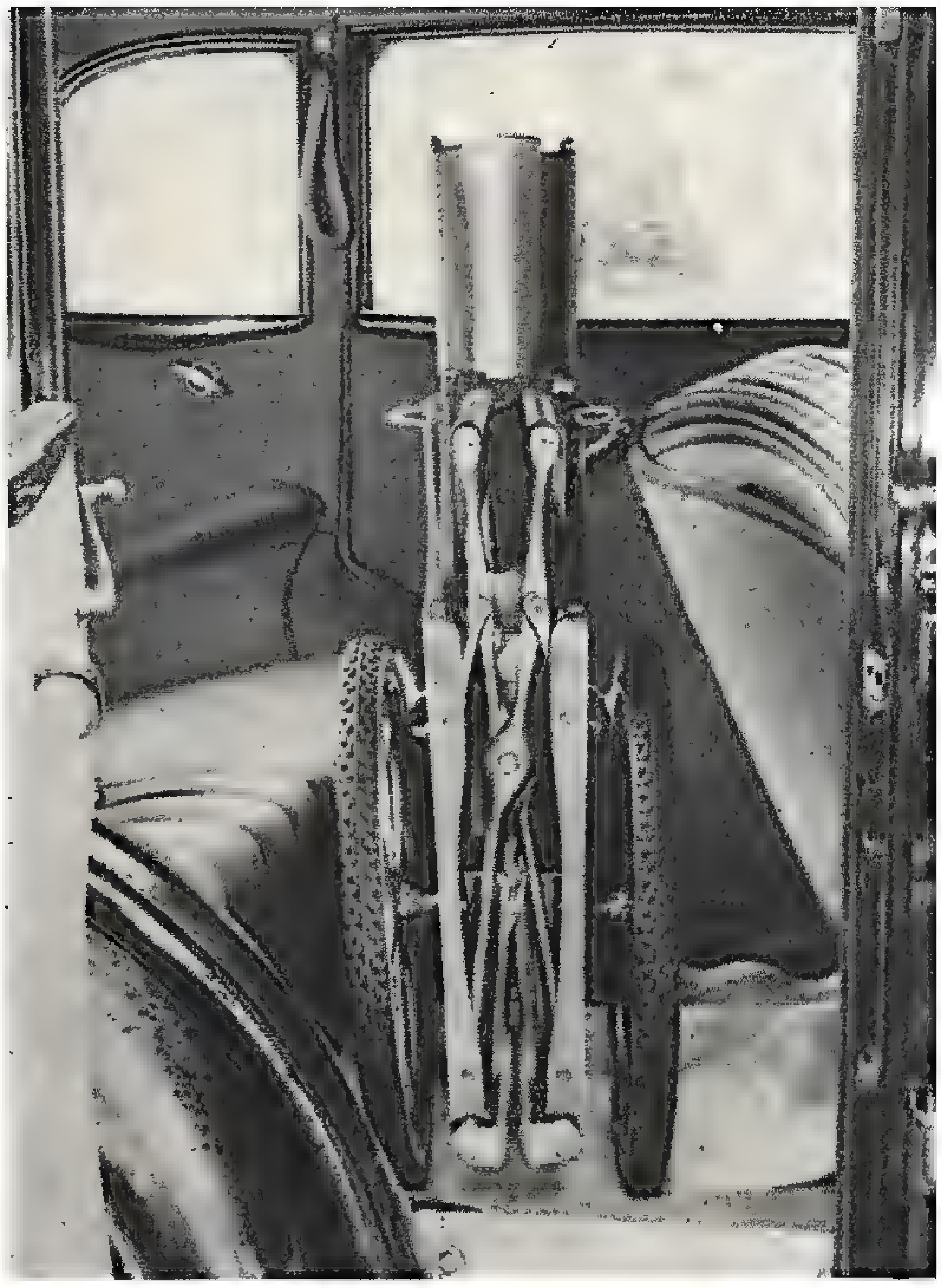
"Total weight of the Q.E.D. is 60 tons," says Mr. Fokker. "Special designing reduced its weight tremendously. Plywood engine beds alone cut the weight of a ton."

Anthony G. Fokker, airplane-designer-gone-boat-builder, is shown in the control room of his "crazy" craft. The big stick on the left controls the special stabilizer shown below.



The specially designed anchor (above, left) drops from the bottom of the boat. At the end of the shaft is an anchor chain. The protruding end of the stabilizer is shown at right. It protrudes, through a shaft in engine room, below the keel.





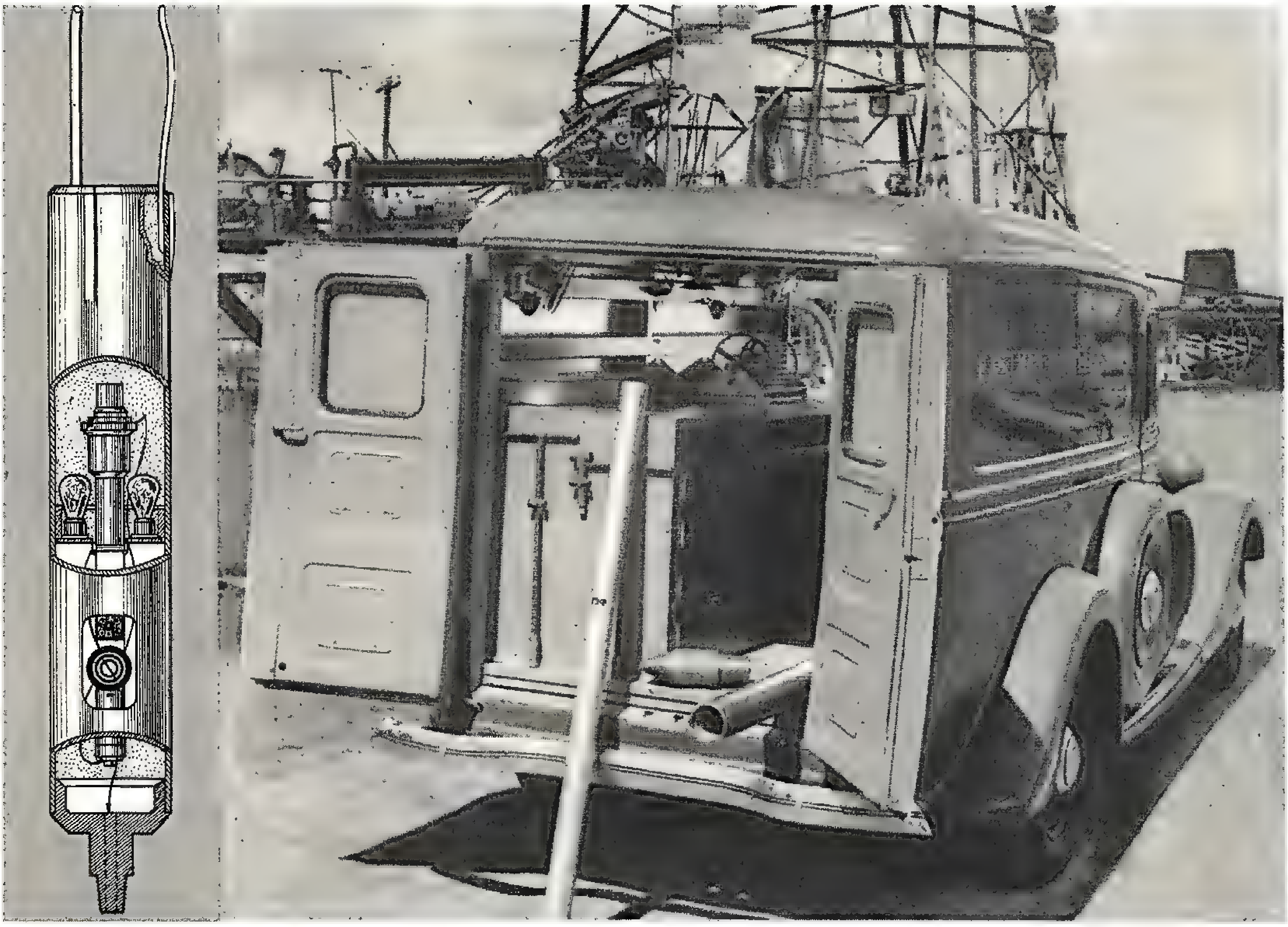
Wheel Chair Features Folding All-Metal Frame

FEATURING a frame and wheels made from heat-treated aluminum alloys and weighing only 42 pounds, a new type of invalid's wheel chair invented by George C. Hyde, of Riverside, Conn., folds to a width of only 10½ inches, enabling it to be carried in the rear seat section of an ordinary passenger automobile, as shown above. The wheels and casters are fitted with ball bearings and the tires on the large wheels are a standard pneumatic bicycle type, insuring comfortable riding and noiseless operation. The seat and back of the chair are covered with leather cushions.

Auto Test Laboratory Reproduces Weather

EQUIPPED to produce inside a laboratory virtually every conceivable weather condition from desert heat to Arctic cold and from sandstorms to sheet-like driving rain, a new "weather tunnel" has been placed in operation by an automobile manufacturer in Dearborn, Mich. The tunnel is 124 feet long, 35 feet wide, and 14 feet high. The photo at left shows a car being tested under conditions simulating a snow storm, the results being shown on gauges.

SUB-SURFACE CAMERA AIDS OIL WELL DIGGERS

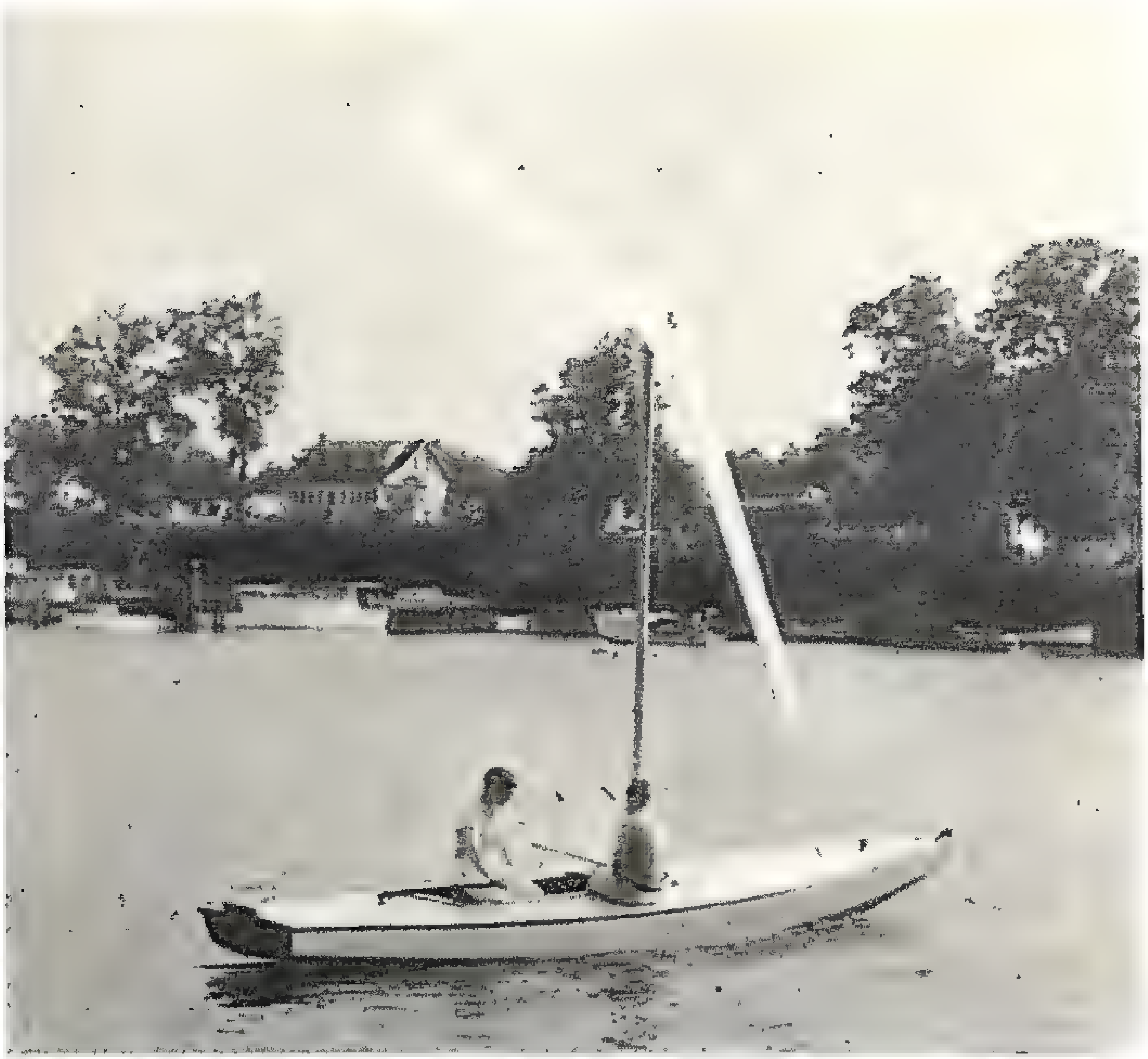


Left—Sectional view of the sub-surface camera showing arrangement of the timing device, flash bulbs and lens (pointing downward). Above—The specially fitted survey truck. Note the facilities for developing and enlarging the sub-surface photographs.

RESEMBLING an elongated anti-aircraft shell in its general appearance, a newly developed cylindrical camera can be lowered thousands of feet into the casings of oil wells, enabling drillers to obtain photographs and thus assist them to intelligently plan the proper procedure for the removal of lost tools and other obstructions which become lodged in the casings. The sub-surface camera consists of a sturdy metal case which houses a timing device and battery for actuating the camera shutter and two photoflash bulbs.

In operation, the well is bailed dry down to the depth at which the photo is to be made. The camera clock and shutter is then set and the camera lowered into the casing where, the proper time interval having elapsed, the flash bulbs are energized and the film exposed. Brought to the surface, the film is developed and enlarged in an auto darkroom.

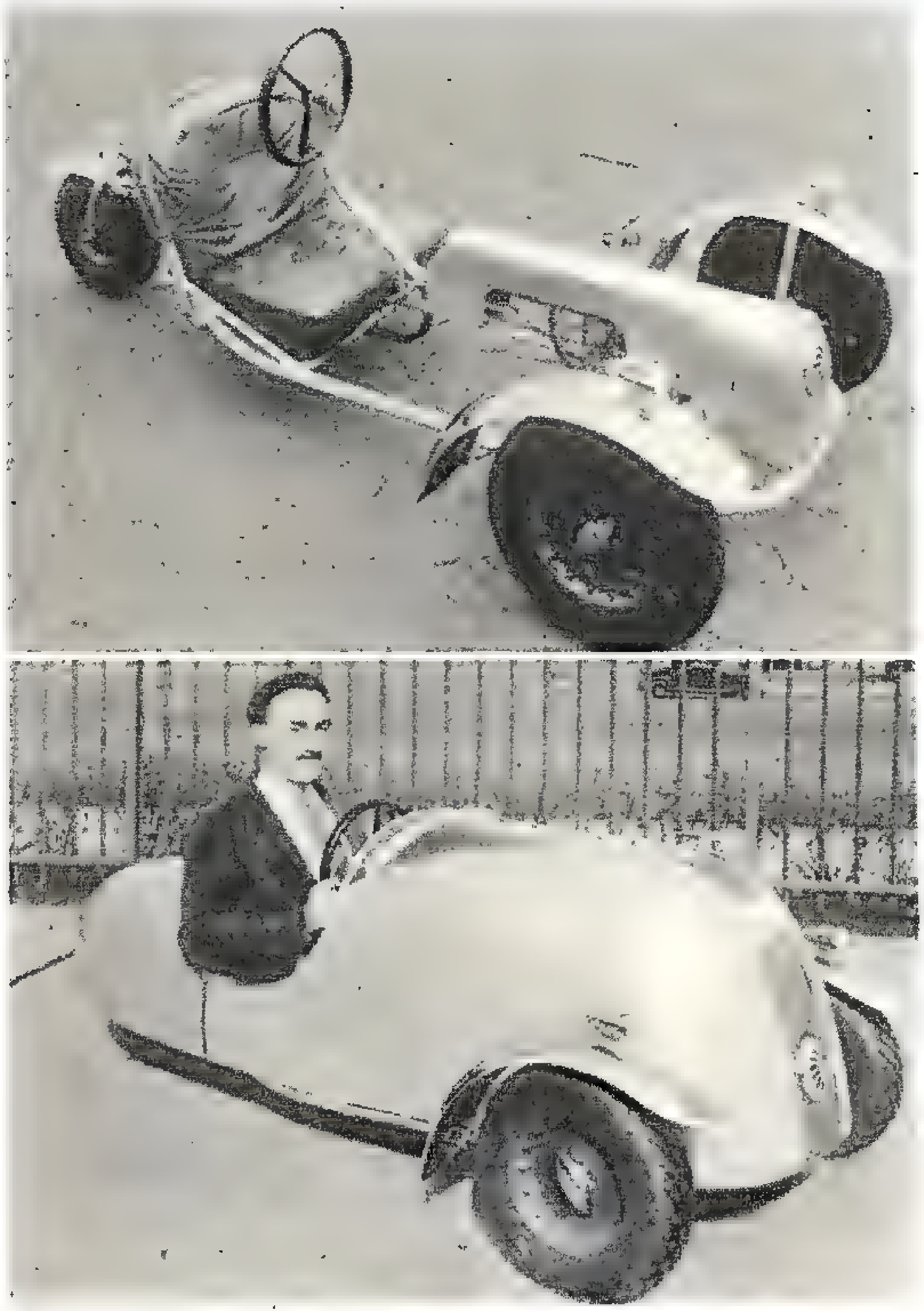
A photograph of the interior of an oil well casing taken by the sub-surface camera at a depth of more than 5,000 feet.



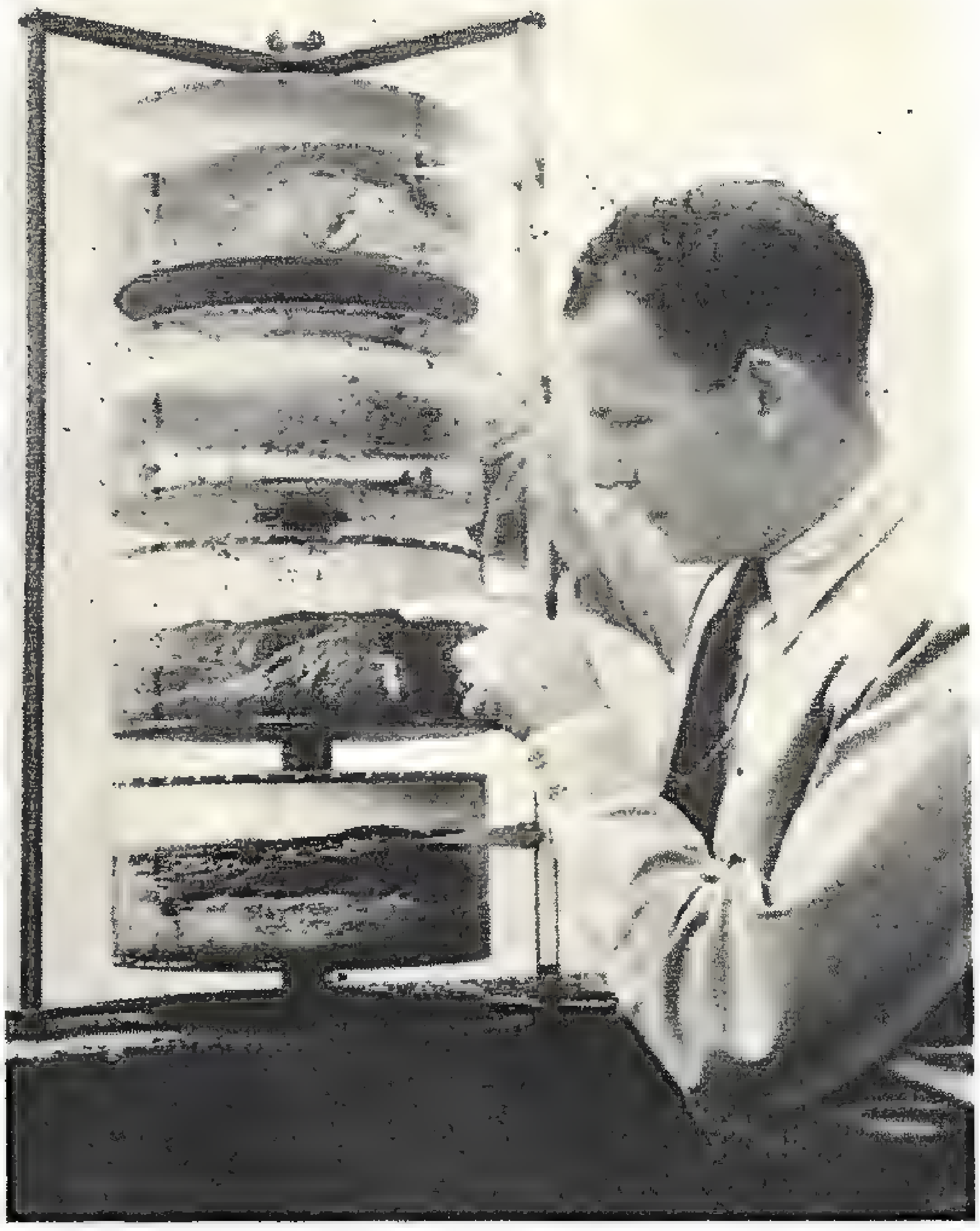
Rotor "Sail" Pulls Boat Over Water

EQUIPPED with a three-bladed rotor instead of a conventional sail, a novel "windmill sailboat" has been constructed by Burk Wilford, of Philadelphia, Pa. A hand lever controls the angle at which the rotor is set, enabling the blades, which are similar in shape to the wing of an airplane, to strike the air in such a manner that they create a forward pull as they revolve. A hand brake enables the sailors to stop the rotor, thus halting the boat. By changing the rotor's position, the boat can be made to go backwards.

Auto-Bike Has Three Wheels



RESEMBLING a midget auto in appearpearance, but pedaled like a bicycle, a new three-wheeled vehicle has recently been developed. The photos above show the car with and without its sheet metal body.



Panorama Unit Aids Rangers

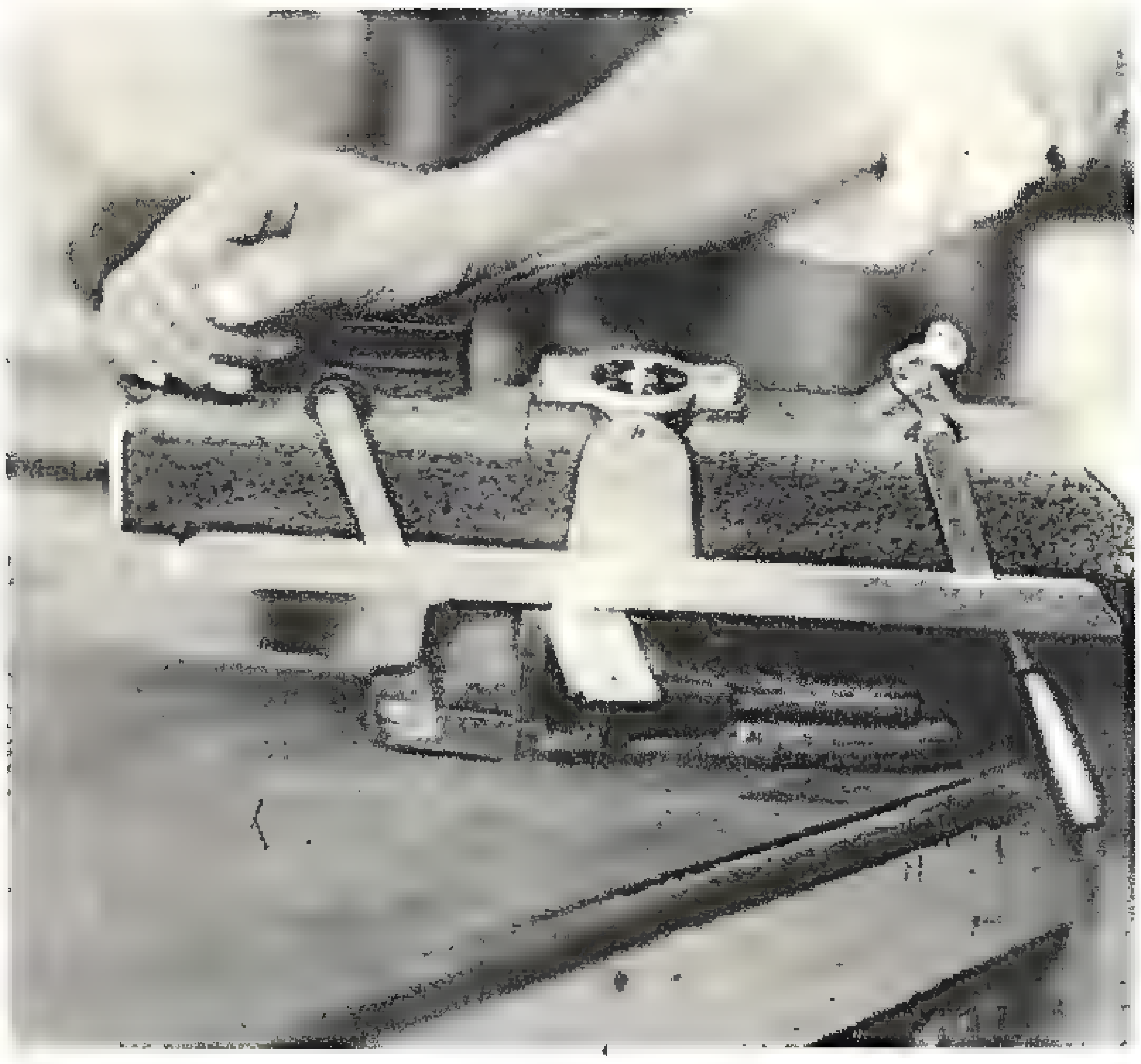
CONSISTING of a rotatable rack containing panoramic pictures taken from four different towers whose coverages are composite, a new device enables forest rangers to indicate the direction and elevation of a forest fire, facilitating the work of fire-fighting ground crews.

Device Measures Distant Heat

CLAIMED to be capable of measuring the temperature of any distant object, a thermometer device designed and constructed by Dr. John Strong, an astro-physicist, resembles an electric telescope in appearance. In tests, the device successfully gauged the temperature of lemons and oranges located in groves hundreds of feet away. The thermometer is equipped with a lens made of rock salt (glass would stop the rays) which focuses and concentrates the heat rays of the object being examined on a quartz crystal. The heat eventually reaches two wires which create a minute electric charge that is measured by a sensitive galvanometer calibrated in terms of degrees of temperature. Dr. Strong is shown adjusting the device.

Develop Automatic Oilstone

REQUIRING no special skill, a new automatic oilstone device enables the operator to rapidly produce perfect cutting edges and bevels on hand tools such as chisels and carpenters' planes. The device consists of an aluminum base, one end of which houses a two-sided oilstone, and a smooth steel-topped table on which rests a bronze holder that holds the tool at the desired angle as it passes over the oilstone.



File Operates Mechanically

POWERED by a controlled air pressure ranging from 60 to 100 pounds which provides stroke speeds of from 50 to 300 per minute, a recently developed mechanical file has a stroke that can be varied from one-quarter inch to three inches. Any size or type of file can be quickly fitted to the device by means of small clamps.

New Machine Washes Walls

USING a special cleansing fluid and mechanical applicator pads that eliminate dripping water and suds, a new portable machine enables walls and ceilings to be washed with a minimum of effort.

Organ Improves Telegraph

A NEW development in communications service utilizes the tone generator principle of the electric organ, making it possible to send 96 telegraphic messages in one direction over a single circuit simultaneously. The photo above shows two operators sending and receiving messages over a tone channel provided by an organist at a console. In commercial practice, the electric organ generator apparatus is concealed.

Engineers Make Cable Tests

MINIATURE samples of high-voltage oil-impregnated paper-insulated cables are being used in the laboratory of a well known electrical products manufacturer to assist engineers in the development of improved cables. Under high-voltage stresses, electronic or ionic bombardment of the paper causes it to carbonize and burn through, layer by layer. Examination of the paper reveals how the bombardment pounded away, branching out over its surface until the ions or electrons eventually found a weak spot and burned through. Experiments with the miniature cables (left) are less expensive than large-scale tests, enabling the engineers to investigate a greater variety of materials.

Millions From Mercury

[*Continued from page* 57]

entire cooking process requires about one hour.

Quicksilver is transported in iron flasks which have been standardized at 76 pounds and at present is quoted at $90 a flask. During the world war it went up to $300.

Mercury effects our daily lives in many ways. Dentists put much mercury amalgam into faulty teeth. Your felt hat is a mercury-made product. Thermometers function because a thin tube of mercury expands with the heat and creeps high, or contracts with cold and hovers low. A barometer and the mirror in milady's vanity case do not sound closely related, but they are. So are the beautiful vermillion pigments made from cinnabar and the anti-fouling substance which are painted on the bottoms of ships to prevent marine growths.

As a sterilizing agent, it is still one of the most powerful disinfectants known. In other of its compounds, for instance ammoniated mercuric chloride, mercury goes into salves used for infections such as Athlete's Foot.

Agriculture is using mercury in the sterilization of seeds and soils. Yellow oxide of mercury, corrosive sublimate, red oxide, and agricultural calomel belong to this flock of mercurials. They are used, not only to sterilize the seeds before planting, but to treat the soil in which they grow.

Industrially, and especially in the field of electricity, the uses of mercury appear due to play a far more vital part. Quicksilver figures in many tricky technical devices.

Developed within the last few years, the mercury turbine bids fair to be our greatest single user of mercury. It directly refutes what had been thought "impossible"—that volatile quicksilver can be harnessed and put to use at high temperatures. The mercury turbine is built on the same principle as the steam turbine, but—using mercury vapor in place of steam—it is proving the most efficient method known for the generation of power from fuel.

Among newer users who will draw heavily on mercury in coming years, are makers of cast iron pipes. They discovered that with the aid of hot mercury vapor, pipes may be kept hot enough during casting to produce a thinner, lighter piping.

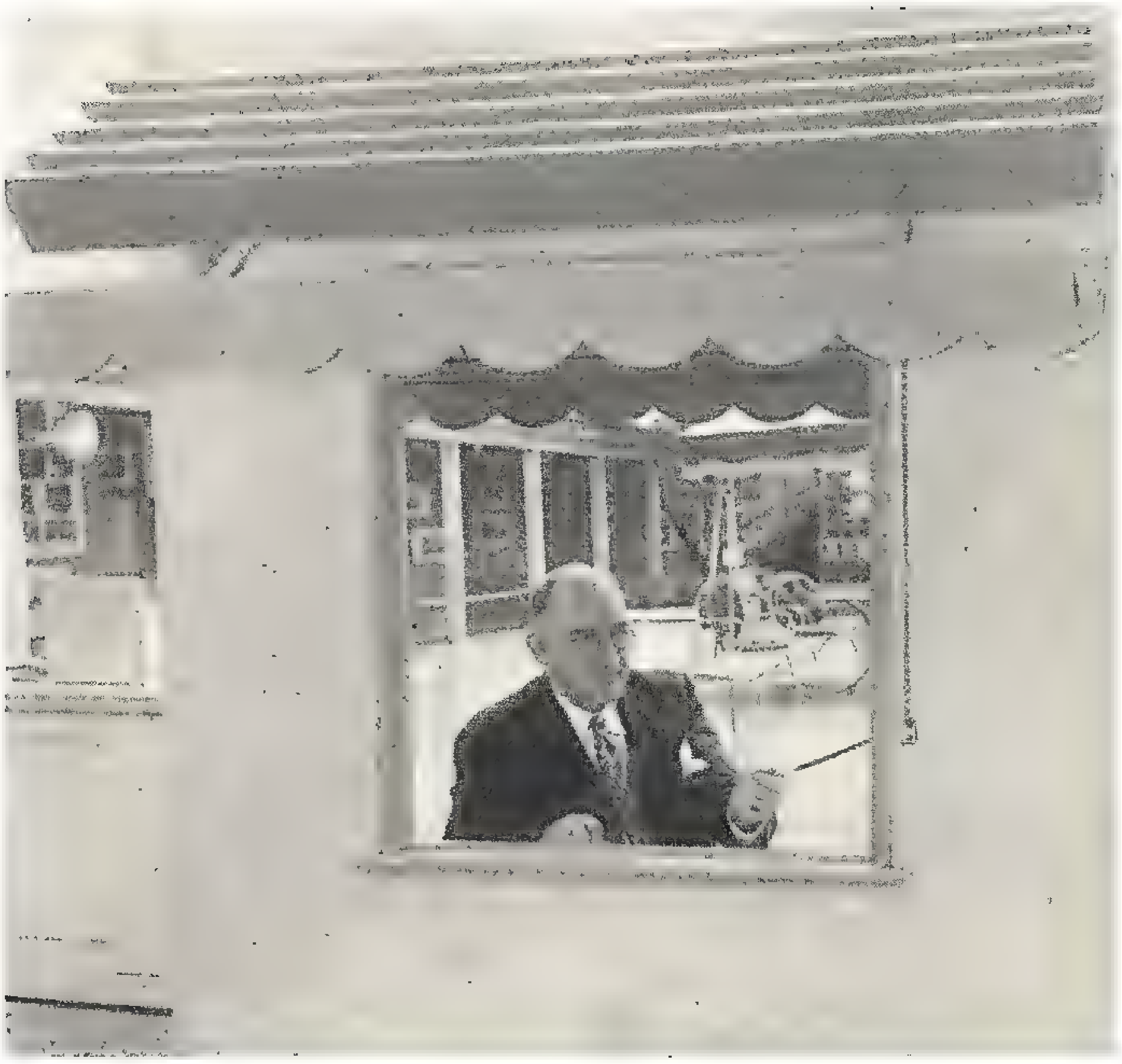
Some 14,000 flasks, or 1,064,000 pounds, of mercury are tied up in the caustic soda industry which uses an electrolytic process in manufacturing caustic soda from salt. Use of mercury figures importantly and one pound of metal is lost per each ton of caustic soda manufactured. Mercury has been substituted for tin with excellent results in producing many of the newer metal alloys. Newer solders contain 4 per cent to 8 per cent quicksilver.

Gold mining still consumes large quantities of mercury and every prospector who has a little sluice box treasures his bottle of mercury as he does his gold pan.

The extent of the world's deposits of mercury is entirely conjectural. Engineers believe that because of its volatility tremendous quantities were lost by gaseous eruptions in earth's geologic upheavals. But there is still much gold to be had from mercury in them thar hills!

Wooden Awning Has Adjustable Shutters

EASILY installed above the windows of a home, newly developed wooden shutter awnings provide unrestricted view or shade at will, being fitted with removable blades which are adjustable to any pitch by means of a chain control inside the home. The awnings can be raised or lowered due to angular arm-braces. The wooden awnings have an advantage over canvas types in that they can be repainted each season, if desired, adding a touch of freshness to the exterior of a home or bungalow at very little expense.



QUICK

Some of the Los Angeles police department's crack shots are shown working out on the Elysian Park range. Each man must shoot a minimum score monthly. Failure to qualify requires spending extra time on the range.

America's 1937 National Individual Pistol Champion tells how a sensitive trigger finger once saved his life as well as won him national fame as a pistol sharpshooter.

by Lt. Emmett E. Jones

"GIVE me your poke, buddy," growled a dark figure as it approached from behind a tree one black night. I was sitting in my car and he thrust the gun in my side.

"I've no wallet," I answered, "but I have a little money in my pocket."

"Keep your hands on the wheel," commanded the bandit.

He took $13 in currency from my pocket, then ran his hands under my coat in search of a weapon. Fortunately he didn't reach far enough to discover the regulation police .38 hanging from its holster at the right. Then he drew the watch from my vest pocket and began to pull on the gold chain.

On the other end of the chain hung my badge. I knew that the instant the bandit found that, he would probably "let me have it," right there, for his confident manner made it plain that he was an old hand at the game and doubtless had old scores behind him.

Meanwhile, however, I had been letting my hands creep very slowly downward on the wheel until my right-hand finger tips touched my holster. In another instant he would find the badge and the game would be up. But I figured that on the show-down if I could get in one good shot it would give me a fighting chance.

As the bandit centered his attention upon the watch, his left hand, holding the gun, wavered a little. That was my cue. Lashing out with my left, I knocked the gun barrel downward. At the same time my fingers closed on my own gun; I drew and fired one quick shot. And that was that.

I was lucky, for investigation showed he was a thoroughly bad-egg—a "three-time loser," and would have no compunction whatever in killing me. I can thank long hours

ON THE DRAW

These are the targets in the Elysian Park range where crack shots work the kinks out of their trigger fingers. Good marksmanship is rewarded by bonuses up to $16 monthly. They train constantly in order to stay in the money.

on the target range for that confidence which helped me take a long chance on a single shot. For once I realized that there was something more than winning competition in being a crack shot and I sure was glad I was a champion at it. Suppose I had missed . . .!

The only time a bad shot ever did me any good was when I won the 1937 pistol meet at Camp Perry. At the time I thought one miss was pretty good shooting but tonight I realized how fatal one bad shot might have been.

How did I win a match on one bad shot? It happened late one autumn afternoon as I stood in a lineup with a hundred-odd other contestants, facing a long row of targets behind which glimmered the waters of Lake Erie. It was the final series of matches in the annual National Pistol Competition, conducted by the War Department at Camp Perry, Ohio. More than 700 of the nation's best shots, recruited from all branches of Government service, police departments, and some civilian groups, were shooting for the title of National Individual Pistol Champion. The competition was gruelling, the events

Lieut. Emmett E. Jones is shown holding one of his favorite pistols. A few medals won in competition appear in the background. What it takes to be a champion is explained by the champ in this story.

moving along with military precision under the competent direction of Army and Marine officers, one of whom stood behind each pair of contestants, to make sure that all rules were observed and that nothing but regulation Army ammunition was used.

The War Department wastes no time. Promptly the officer in charge barked out an order:

"Slow fire—ten shots, one minute per shot!"

Simultaneously all the targets revolved on their pivots and stopped facing us. A crackling, desultory barrage of shots sputtered and died. Then the targets whipped round from sight.

In a moment came a second command: "Time fire—five shots in twenty seconds!"

Another barrage, another deafening silence.

Then a third command: "Rapid fire—ten shots in groups of five, ten seconds per group."

As the tempo quickened and the firing blended into a mighty, continuous roar, my first four bullets streaked towards the center of the target, and splattered into the "9" and "10" rings. As my trigger finger automatically reached for the final shot, I felt a sudden unaccountable impulse to empty my gun, and to do it quickly. I did exactly what I had spent months learning *not* to do—I "helped" the trigger by giving an imperceptible quick jerk.

Trophies won by Lieut. Jones in competition are shown here. Large figure represents a sugar cane cutter and was won in the Pan-American International meet. Note General Custer trophy amid the other cups.

That tiny movement was just enough to spoil an excellent aim. The fifth bullet went flying low into the "6" ring.

As the target flipped from sight, the Army officer behind me spoke.

"You were doing very nicely until that last shot," he commented.

"Yes," I growled, between clenched teeth. Then black fury overcame me and I added: "—and I'm going to put the next five shots into the black if it's the last thing I ever do!"

In cold anger I waited until new targets rose to position and suddenly flipped forward again. Taking a cool, deliberate aim, I fired, bearing down on the black bull's-eye as if to bore straight through it by the very thrust of the muzzle.

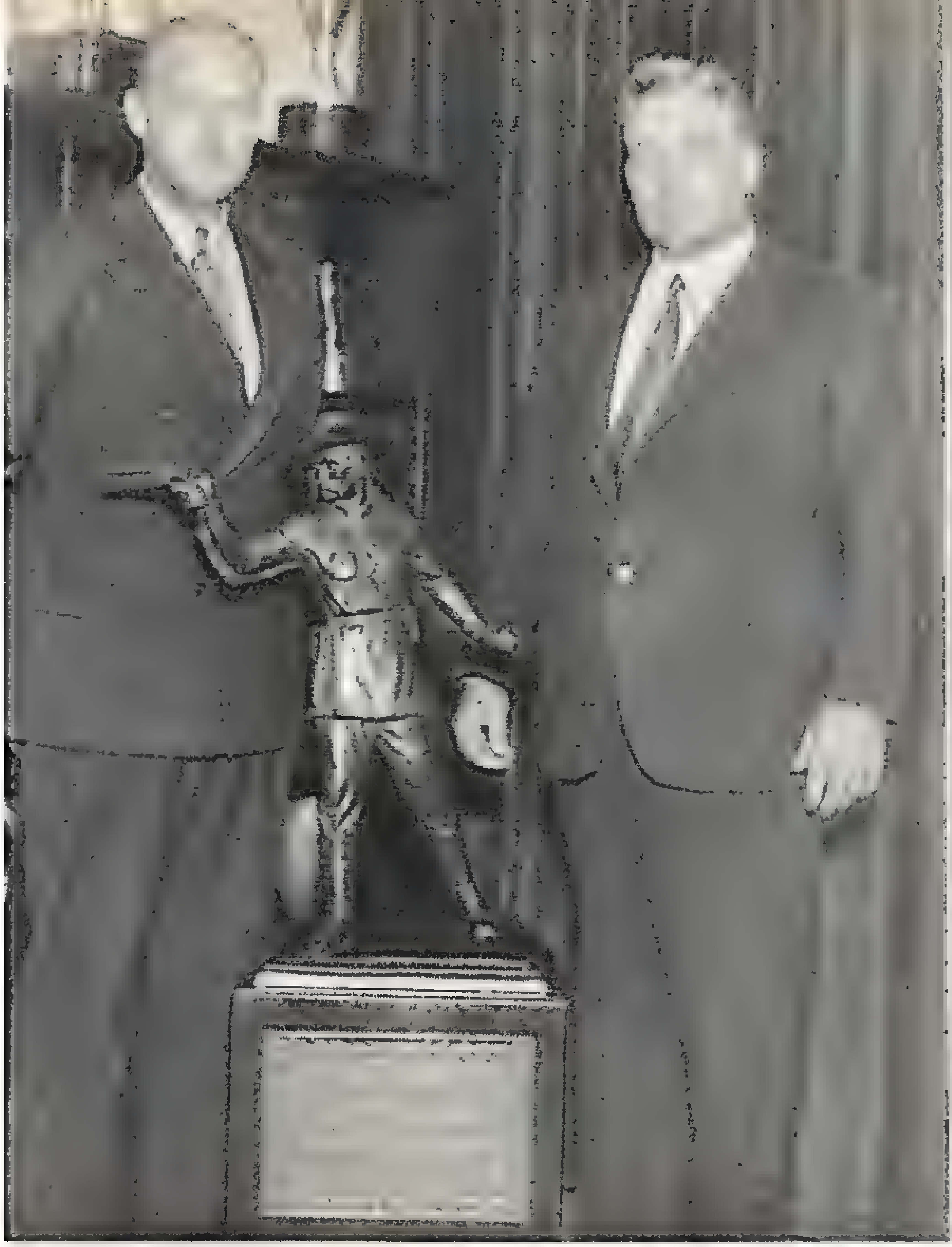
One, two, three, four, five—and the center of the card showed a cloverleaf hole in the inner rings—a nearly perfect score!

As the next relay of contestants took our places on the firing line, I made a bee-line for the judges' stand, and anxiously scanned the showings already chalked up, looking for the "hot shots" who, I knew, would probably place highest. So far no one had rated higher. When the last volley had died away, and still nobody had bettered my score, I knew I had won. And the lesson came home to me with thrilling force: Don't let one bad shot spoil your game!

I honestly believe that if I had made a perfect score, the realization would have spoiled the cool, determined concentration which is absolutely essential to accurate pistol shooting.

Concentration—that's the fundamental secret of markmanship. Even a tyro may make an occasional bull's-eye, and the most experienced sharpshooter sometimes gets off his stride; but give me the man who forgets everything else in the world when he looks down along a pistol barrel.

You don't have to be born with a silver bullet in your mouth, nor cut your teeth on a gunstock to climb right up the ladder to top rank of markmanship. Only moderate natural ability is needed if you are willing



Lt. Jones is shown with the General Custer Trophy which he won at the Camp Perry meet. This trophy is re-awarded each year by the War Department. Jones may have retained or lost it for 1938 by this date.

to set aside a regular time for training yourself. Consistent practice—perhaps only a few minutes a day, but continued over long periods of time, will do wonders for any one, particularly if he has the enthusiasm to keep himself keenly alert after the thrill of shooting has lost some of its novelty.

During the 1937 Camp Perry match, the National Riflemen's Association selected fifty outstanding slow-fire pistol-shots from among the contestants, then staged an elimination contest to choose a ten-man team of American marksmen to meet a corresponding British slow-fire team. Of the ten who ranked highest, five of us were Los Angeles police officers—and later our team won the International match by 120 points. To my mind there's clear proof that consistent training over a long period of time unfailingly turns up a large percentage of first-rate marksmen.

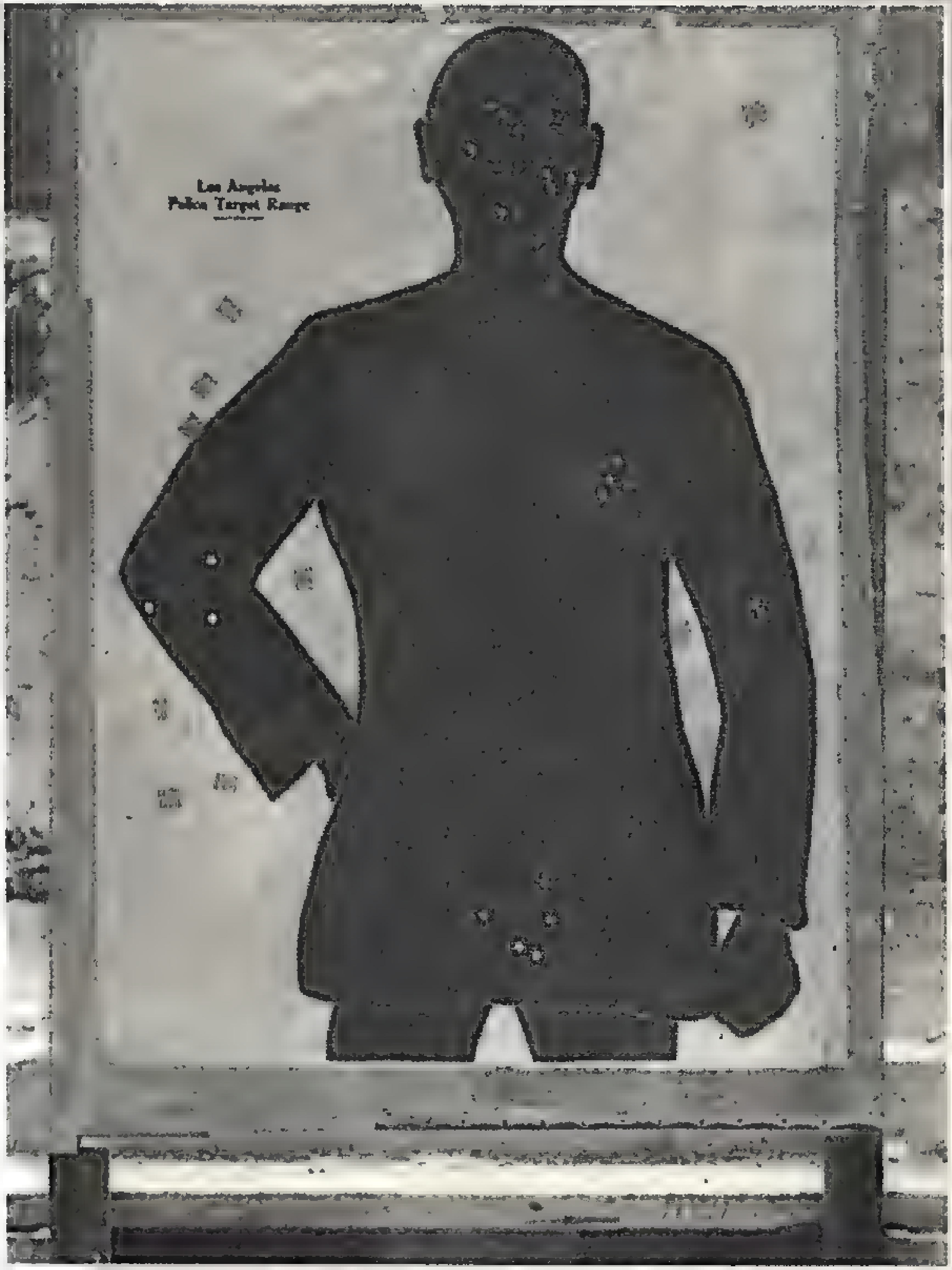
Some pistol shooters like to go on an occasional orgy of practice, especially when an important competition is coming up. I think they do themselves as much harm as good. It's the old hare-and-tortoise story—the fellow who creeps, but keeps plugging along gets farther in the long run. It's too easy to "go stale."

Personally, the week before a match, I like to shoot about ninety rounds a day—thirty in slow fire, thirty at a time, and the same at rapid fire. That gives me three times over the course, without overtaxing wrist or arm muscles.

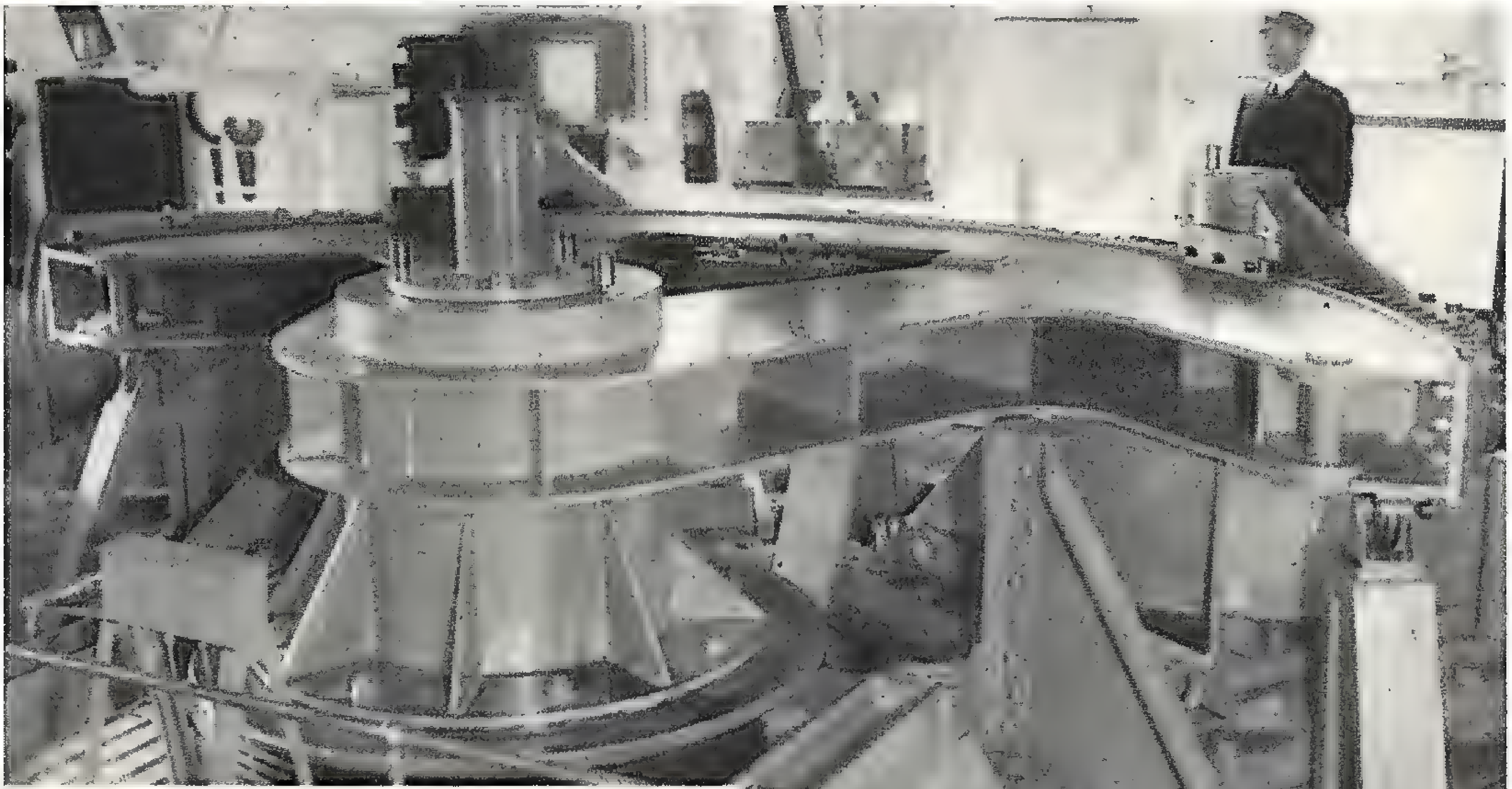
Correct stance—weight evenly distributed on both feet, the body at an angle of about 45° to the line of fire, the arm extended straight without undue tension; a confident frame of mind, good eyesight, correct breathing, and plenty of the right kind of practice—these are the necessary ingredients of good pistol shooting. Of all these, none is more important than correct breathing.

In slow fire, fill your lungs; let the air out; then take about half a breath before firing. This puts your muscles

[Continued on page 79]

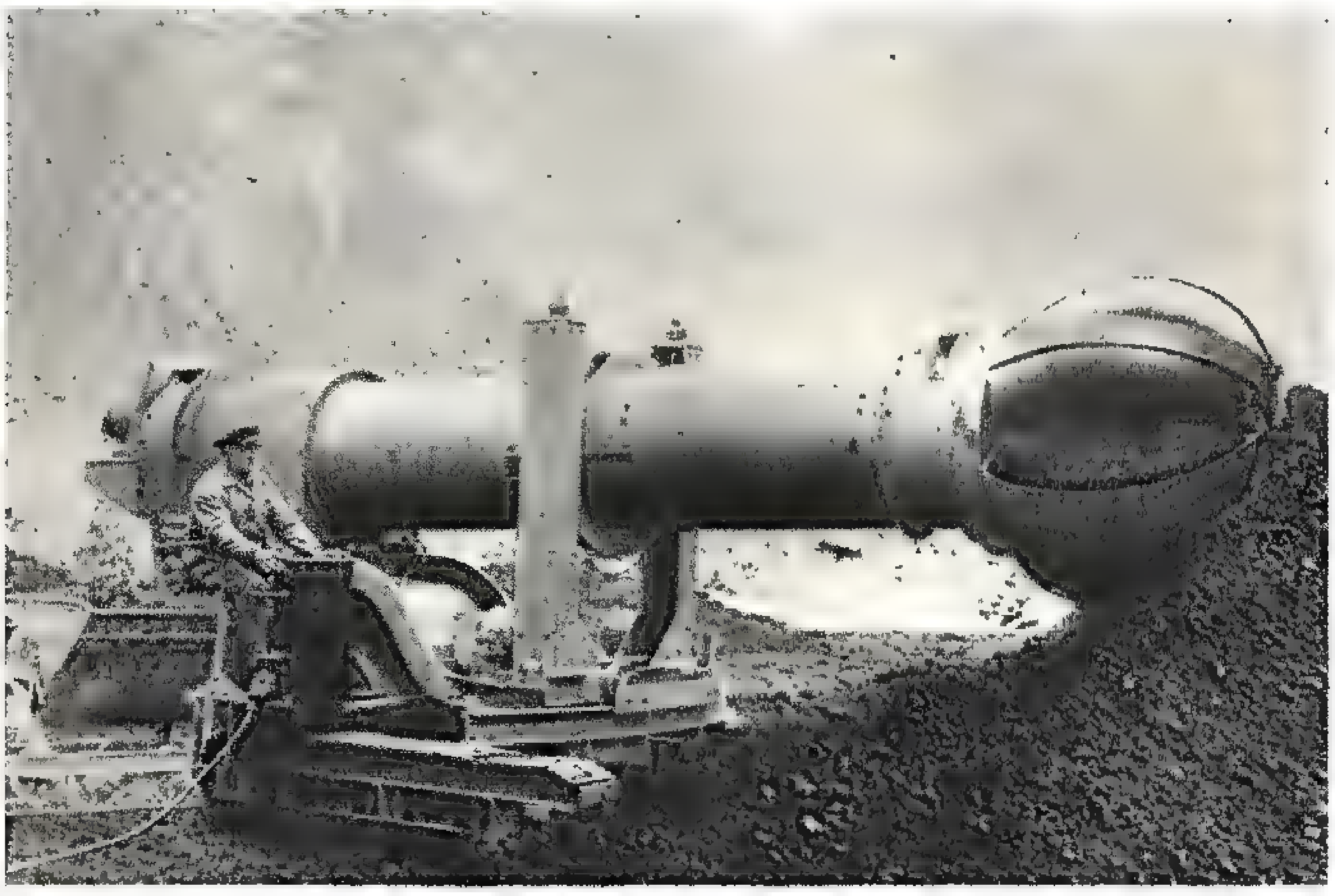


This target shows the effect of good pistol shooting. Note how bullets have reached vital areas of the figure: groin, elbow, heart and head—easy enough to do on a still target, but how about a moving figure?



Buttons Steer Ocean Liner

A RADICALLY new method of steering is a feature of the Norwegian-American ocean liner *Oslofjord* which recently completed its maiden voyage to America. The diesel-powered vessel is steered entirely by two push buttons (left), which automatically control the rudder mechanism (top). The push buttons represent port and starboard and, to operate the rudder, the helmsman merely presses either button and holds it down until a visual indicator device shows that the rudder has reached the desired position. Releasing the button immediately stops the action of the rudder.



Excavating Machine Has Ball-Like Head

A RECENTLY developed excavating machine features a rotating ball-like head fitted with six scoops which are operated in the same manner as a bucket dredge. The scoops collect the dirt, or other material, and carry it to a conveyor belt inside the tubular backbone of the machine which deposits the dirt in lorrys some distance away.

G-Men Fight Crime

[*Continued from page* 41]

of Dr. Davis in an open corn field twelve miles from his office. He had been shot three times with a .25 calibre gun. Such a gun was found on Kenyon and markings on bullets fired from it corresponded to markings on bullets taken from the dead doctor's body when viewed under the comparison microscope. In the home of Kenyon's sister was found a paper pad corresponding to the paper used in writing the second ransom note and on a sheet of this paper was found indented writing corresponding to the exact wording of the second note. Handwriting experts testified that Kenyon's was the hand that wrote the second note, which was mailed before he was arrested.

At the trial, transparent photographs revealed that the indented writing found on the blank paper corresponded to the third page of the ransom note. Transparencies also showed that the indented writing on the pad in Kenyon's sister's home were of his handwriting, and the same as the second note. Laboratory experts revealed that the bullets that killed Dr. Davis were fired from Kenyon's .25 calibre Colt revolver found in his possession—and his conviction resulted.

Although handwriting, paper analysis and bullet examinations play a large rôle in the work of the crime laboratory, clever technicians perform uncanny examinations involving bits of thread, cord and wire.

Many crime cases are solved by the relatively conventional process of bullet comparisons or bloodstain analysis, but frequently cases occur in which the entire resources of science are brought into play. One such case was that involving John Magnuson, arrested for murder committed by sending a bomb through the mail. The package exploded when it was opened and killed the wife of the addressee. Experts testified that the handwriting on the package was Magnuson's. Microscopic examination showed that the address was written by a pen having a round point similar to the pen of Magnuson's daughter's and the ink in the pen gave the same reactions to chemicals as the ink used in addressing the package. Glue used to seal the package was the same as glue in Magnuson's possession. The wood covering the bomb was identified as white elm. Microscopic examination of the sawdust residue in Magnuson's workroom indicated white elm residue as well as hemlock and oak. This proved important because the defendent claimed he never used elm. Another expert analyzed the metal in the trigger of the bomb and compared it with metal from a gas engine found in Magnuson's home. By analysis and with the aid of photomicrographs, metallurgists identified the metal in the trigger as being identical in crystalline formation as metal taken from the gas engine. This was significant, as it was testified by experts that no two metals are identical in formation unless made in the same batch of 100 pounds each. Photomicrographs were produced showing the matched edges of two pieces of metal, one from the bomb and the other from the engine. On the basis of this over-whelming evidence, Magnuson was found guilty.

In all cases investigated by the FBI, science takes up where human limitations leave off. No longer can a man obliterate identification numbers from metal by cutting them out, for the crime laboratory men know that the act of stamping a number on metal disturbs its crystalline composition and by means of special instruments, obliterated numbers can be read simply by studying the disturbed formation of the metal. The X-ray machine and ultra-violet lamp as well as the parallel light beams all serve to bring to light invisible evidence that the unsuspecting, unscientific criminal leaves behind him.

The crime laboratory's analysis of physical evidence would astound the cringing criminal who is finding more and more that a technician with a microscope can foil his best laid plans.

The use of physical science occasionally takes on a more violent form. Such was the case with

[*Continued on page* 79]

Sling-Stretcher Eases Patient's Body

DESIGNED specially for use in cases of fracture of the vertebrae, a stretcher invented by Dr. Ralph D. Padula, of Norwalk, Conn., is equipped with an overhead sling that eliminates complications that sometimes arise while transporting patients with injured spines. The photo shows the new stretcher being demonstrated.

What About The

Inflated with non-inflammable helium instead of hydrogen, airships of the future will be safe from the fire peril that ended the career of the *Hindenburg*, above.

"THE fate and future of the airship the entire world over rest unmistakably and unescapably upon the shoulders of the United States of America. A combination of circumstances and natural factors has saddled Uncle Sam with this responsibility. It is one that he can convert to his everlasting glory; it can, on the other hand, become a hardly creditable chapter in our aeronautical history, unless we recognize the true facts and meet the situation squarely. The fate of the airship can be either extension or extinction. That Uncle Sam should turn quitter and resort to extinction of the airship hardly seems an American trait. Granted extension, it is my opinion that the future of the airship is a bright one.

"The biggest stumbling block in the path of airships today is misunderstanding. There is but a comparative handful of people in the world today who have first-hand knowledge of them. Almost invariably, the airship critic who is inspired only by honest doubt will, when backed into the corner, admit that his ideas or opinions are based on second-hand information and hearsay. *It is a most significant fact that every organized group—scientific or lay—that has yet investigated the airship has found much in its favor.*

"The points in today's situation that seem so unfair to the airship are the unwillingness to accept the airship as a proven oceanic carrier available *today;* the unwillingness to grant that the airship will retain a place in oceanic transport when the airplane also eventually achieves that field; an almost crusading fervor to credit the airplane with nearly unlimited possibilities of development, at the same time ignoring improvement in the airship; and a desire to keep the airship out of the picture while we await realization of airplane dreams.

"The inherent advantages of comfort, safety, etc., of the airship over the ocean flying boat, together with the fact that today the non-

Airship?

by
Comm. C. E. Rosendahl,
U. S. N.

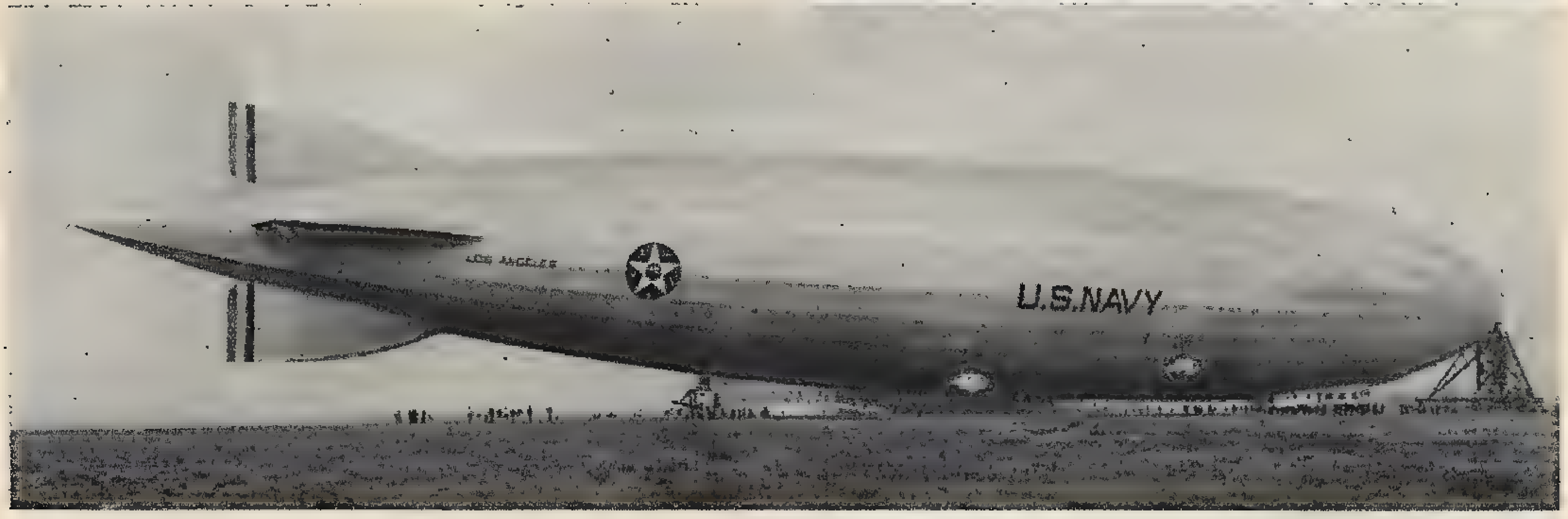
stop airship can span the Pacific in *one-third less total time* than the flying boat service, entitle the airship to remain in the picture. Are the *Graf Zeppelin's* 590 flights, 1,053,391 miles, 13,110 passengers, 235,000 pounds of mail and other cargo, and 144 ocean crossings to be regarded only as 'gestures'?

"Once more I feel constrained to emphasize that whether deliberately or accidentally engendered, the destruction of the *Hindenburg* by fire does not legitimately raise any question as to the basic safety and merits of airships employing non-inflammable inflation gas. The loss by fire of the steamships *General Slocum* with 1,021 lives in 1904, and the *Morro Castle* with 122 lives in 1934, did not condemn steamers as a type. Within three months after the airship fire, the newspapers had reported several fires occurring in commercial airplane operations, and the loss of more lives than in the *Hindenburg;* yet no one questioned the merits of airplanes just because of these unfortunate fires. Had she been inflated with helium, the *Hindenburg* could never have met such an end. Up to the moment of her consumption by fire, this ship had been a decided success, and had added to the laurels of German commercial airships already won by the eight years' operations of the *Graf Zeppelin*.

"From the fuss and fury with which they have so often been surrounded, one might

[*Continued on page* 138]

Commander C. E. Rosendahl, U. S. Navy, is America's No. 1 airship authority. He commanded the *Los Angeles* and *Akron* airships and acted as observer on flights of the *Graf Zeppelin* and *Hindenburg*.



The U. S. Navy airship *Los Angeles* at her mobile mooring mast at the Lakehurst, N. J., naval base.

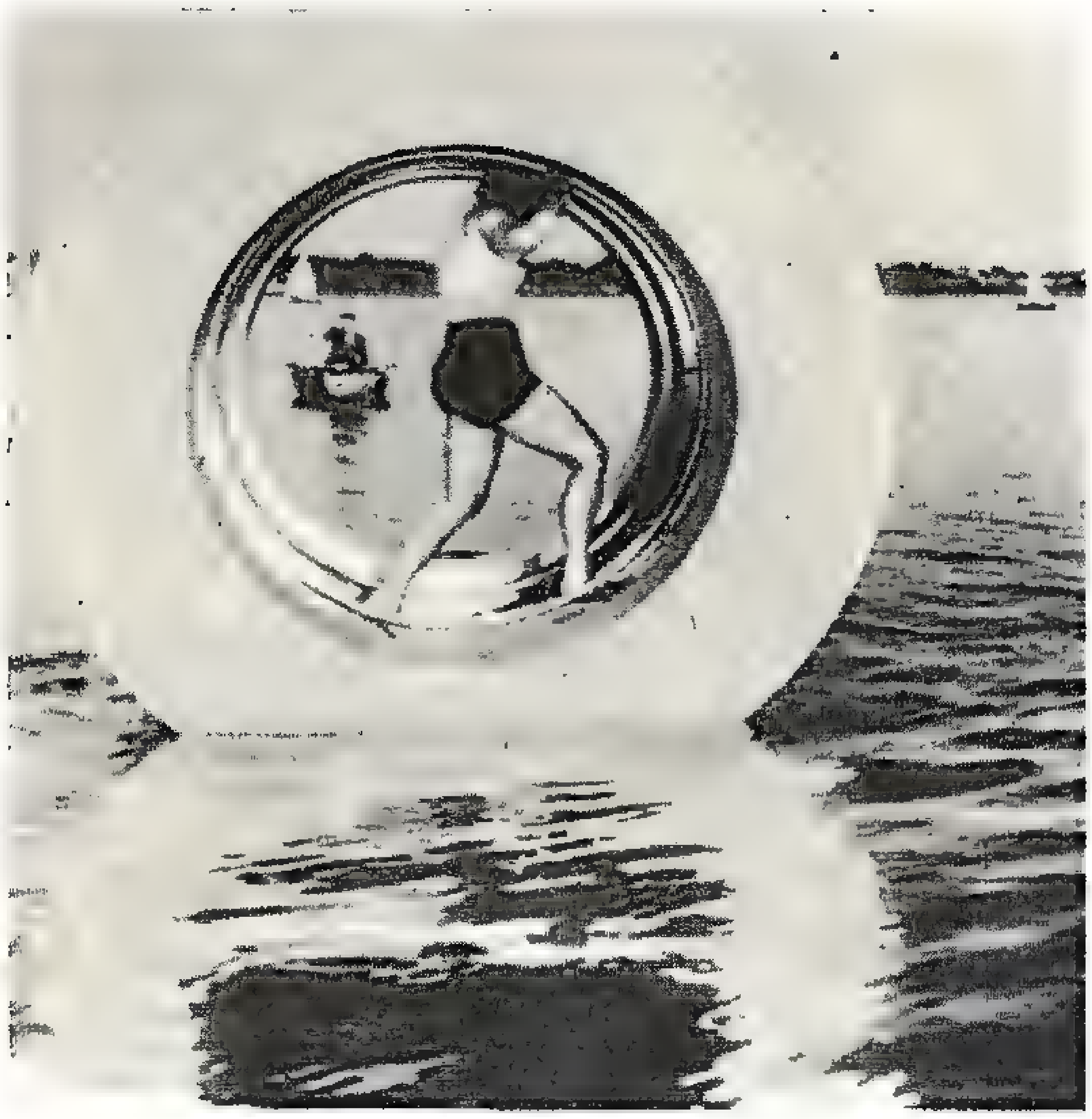
MI'S "BOOK OF THE MONTH"

Every month several meritorious books are published which the editors believe are of special interest to readers of MECHANIX ILLUSTRATED. We know, of course, that you may not be able to read them all, and for that reason we plan to select the outstanding book of the month and present here an extract from it. The books will be chosen for their special interest in the fields of adventure, travel, sports, science, mechanics and history. The episodes selected will be of some complete dramatic or informative incident.

Readers who wish to obtain these books to be read in their entirety may order them from local book dealers, or by mail from the publishers. Every volume from which we will select an extract will form a lasting, worthwhile addition to your library.

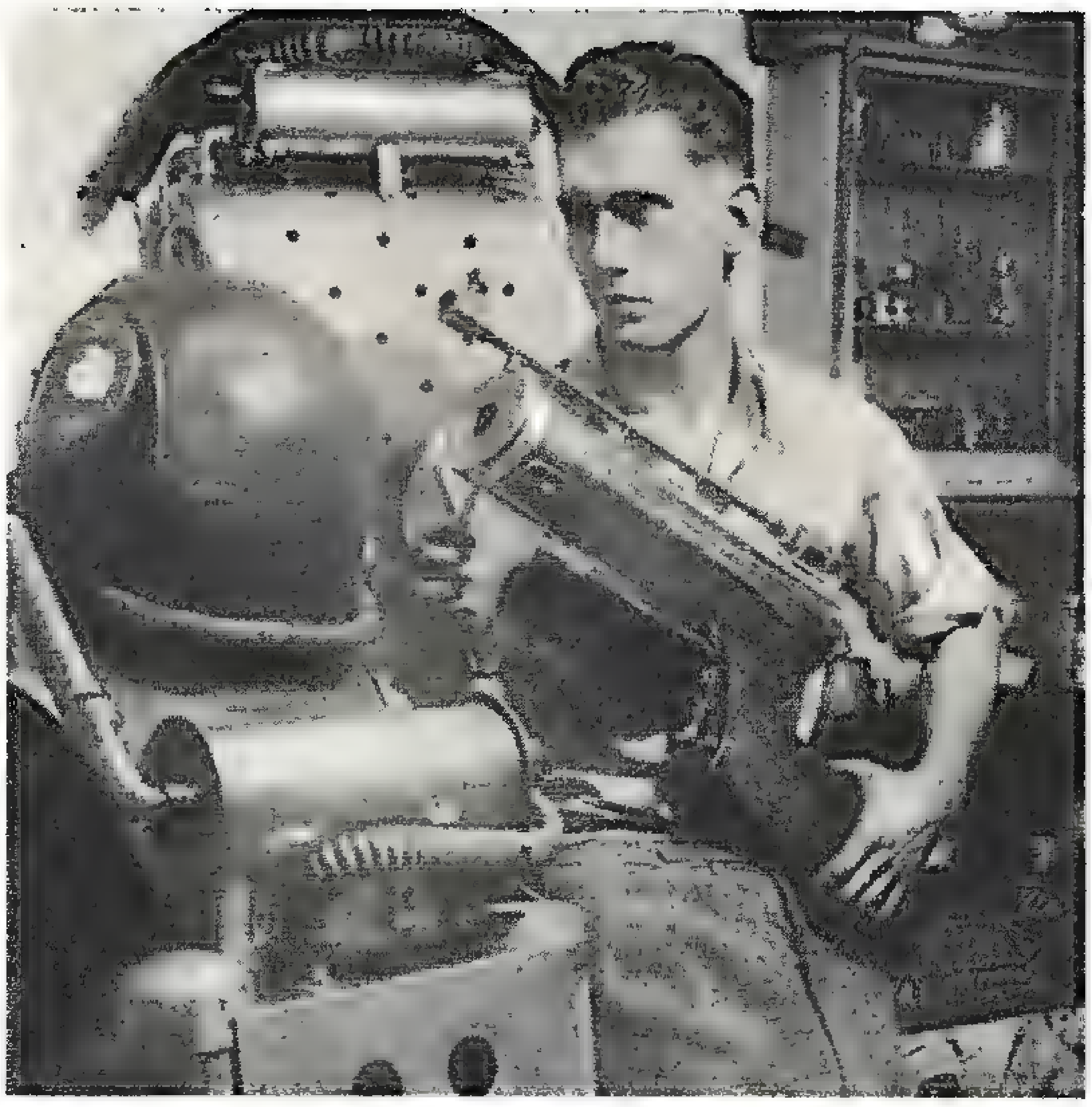
"What About the Airship? The Challenge to the United States", by Commander C. E. Rosendahl, U. S. N., is our choice for October. The publisher is Charles Scribner's Sons, 597 Fifth Ave., New York, N. Y. Price is $3.50.

Gyro Wheel Is Novel "Boat"

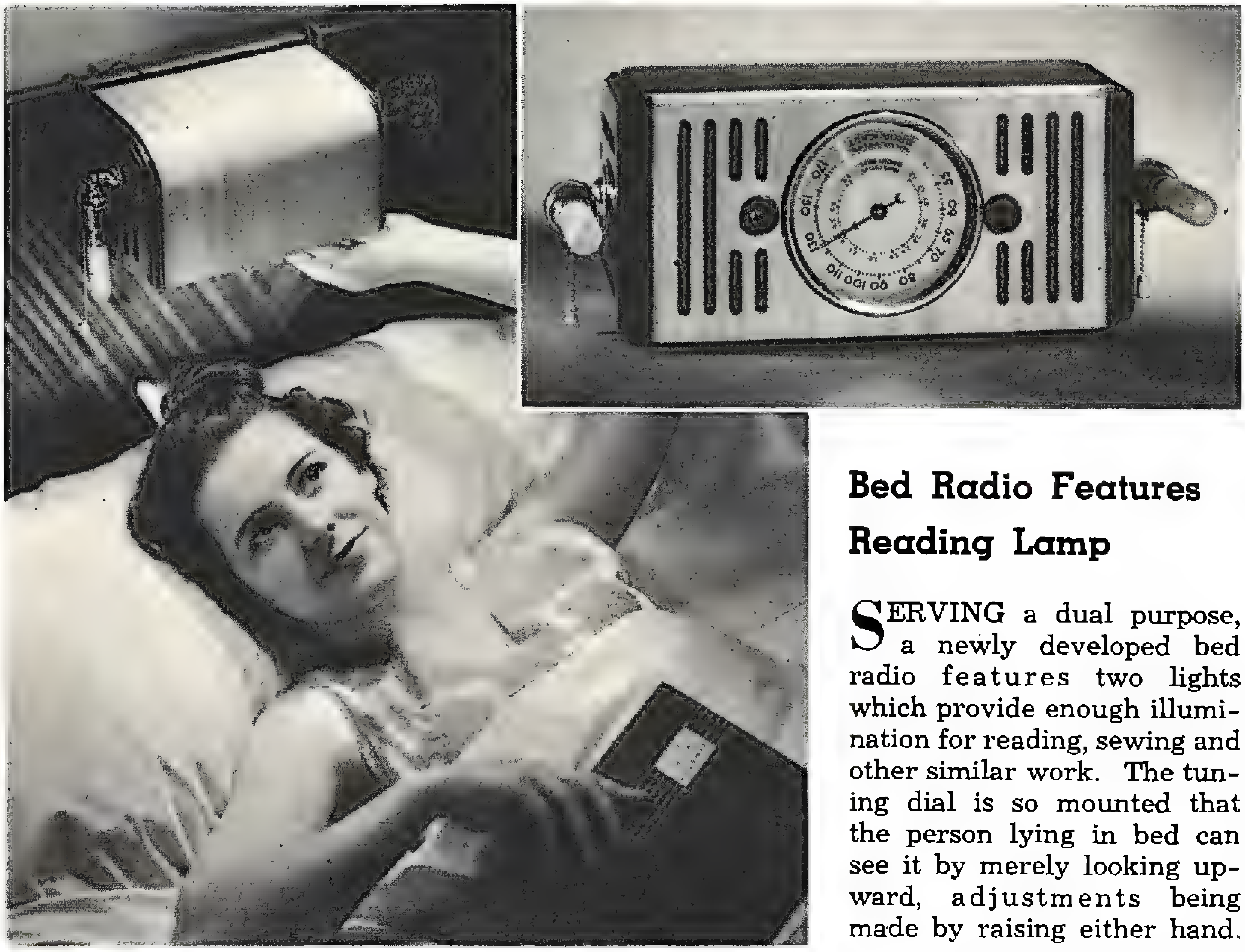


A NOVEL aquatic gyro wheel by means of which he propels himself over the water by rolling over and over has been constructed by H. Schulze, of Hanover, Germany. The wheel is built of wood and light metal.

Air Rifle Shoots Harpoons



DEVELOPED by Ive Vestrem, of Milwaukee, Wis., for deep-sea divers working in shark-infested waters, a new high-powered pneumatic rifle shoots harpoons under water. The firing chamber pressure is 2,000 pounds.



Bed Radio Features Reading Lamp

SERVING a dual purpose, a newly developed bed radio features two lights which provide enough illumination for reading, sewing and other similar work. The tuning dial is so mounted that the person lying in bed can see it by merely looking upward, adjustments being made by raising either hand.

G-Men Fight Crime

[*Continued from page* 75]

the Dillinger gang. Three special agents of the FBI were killed by the thrice-paroled "Baby Face" Nelson, a member of the gang, before he himself was killed in a terrific gun battle with G-Men in Illinois. This same fate was Dillinger's when he attempted to shoot his way out of a G-Man trap.

John Dillinger found out much to his distress that fingertips cannot be changed. In spite of the painful operation which he underwent to change his fingerprints, G-Men established 324 points of identification between his new and old fingerprints!

No longer can a criminal plant a fingerprint and get away with it, nor by trying to erase identification of the victim. Skilled scientists working in the crime laboratory with moulage and plaster are able to reconstruct, by a study of the bone formations, any part of the human body —hands, feet or face—for identification and have succeeded in doing so in a number of important cases. Even the most fleeting descriptions of the alleged suspect is sufficient to enable G-Men to compose a picture of the wanted man.

This was excellently demonstrated in the Lindbergh baby kidnaping of March 1, 1932. J. F. (Jafsie) Condon had tossed $50,000 over the wall in St. Raymond's Cemetery in the Bronx, N. Y., and in doing so, he caught a glimpse of the alleged criminal. From his description, G-Men artists were able to draw a portrait of the wanted man. In the files of the FBI in Washington, a picture of Richard Bruno Hauptmann, executed for the kidnaping in 1936, hangs side by side with the artist's drawing of the man purported to have received the money in the Bronx cemetery—and the likeness is startling.

The artist, the fingerprint expert, the X-ray and microscope technician and the laboratory scientist all combine their ingenuity and skill with modern machines to track down the lawless who steal and rape, kill and kidnap. The record of the FBI has these criminals on the spot. Against humans, they may have had a chance (to give them the benefit of the doubt). But against the crime laboratory the criminal hasn't a chance. Fully 90 per cent of those tracked down plead guilty rather than stand trial against the array of evidence unearthed by the FBI scientists. As Volney Davis, the kidnaper involved in the Bremer kidnaping put it, "Why should I lie to you? You know more about me than I know about myself. I admit this kidnaping. It would be no use for me to deny it."

J. Edgar Hoover's ominous warning to the criminal who crosses a G-Man still stands: "You can't get away with it!"

Quick On The Draw

[*Continued from page* 73]

at ease, so you are neither on a strain because of holding in too much air, nor panting from lack of oxygen. And don't hold your gun out until it becomes an effort, so that the muscles feel wobbly and the heart begins to pound.

What good is tournament shooting, anyway? Now and then I've argued that question with old-timers who hold that pistol shots are born, not made. They should watch marksmen, under the tutelege of Police Department experts, run up scores that would make the average Western hero look like a piker.

As for the individual, some day a well-aimed shot may save his life. There's something reassuring about knowing that if you get in a tight pinch with some thug or bandit, you can hold your own in gun play. Take my own experience—it might have happened to you.

Low-Priced Electric Torch Facilitates Welding Jobs

SPECIALLY designed for welding, brazing and soldering purposes, a low-priced electric torch has been developed by a manufacturer in Chicago, Ill. The device is simple in operation, merely being plugged into a convenient electric light outlet and the carbons adjusted until a blazing flame results. Equipped with various types of rods, the torch can be used to weld aluminum, brass, copper, iron, steel and other metals. Sturdily constructed, the torch is simple in design but can be used for heavy jobs such as welding auto bumpers, cylinders, tanks and industrial repairs. The torch is sold with a complete kit of materials needed to do different jobs.

MI Readers'

THE MI Readers' Service Bureau was started for the express purpose of making MECHANIX ILLUSTRATED a more valuable magazine for its readers. The editors of MECHANIX ILLUSTRATED have felt that too many readers overlook the value of the advertising columns and hence miss many valuable opportunities. After all, many advertisers spend thousands of dollars every month on booklets and literature to supply you with interesting material on their products and related subjects.

MECHANIX ILLUSTRATED censors its advertising stringently for your protection and therefore urges you with full confidence to take advantage of its columns and the many attractive offers made in them.

To bring them to your attention and to simplify your obtaining information from the advertisers you select, all the offers made in this issue, with the exception of those in the classified section, are listed on this and the opposite page.

It is the function of the Readers' Service Bureau to act as a clearing house for both readers and advertisers. The listing gives offers made, the cost of each, and a convenient identifying number. To simplify the ordering of booklets, samples, catalogs, etc., the bureau will forward your requests to three or less of the firms listed.

Merely write your name and address on the coupon, mark the number of the offers wanted, and mail the coupon either in an envelope or attached to a post card. The Readers' Service Bureau will do the rest. It is important that you refer to the advertisement itself before ordering booklets or other material. To simplify this, the page on which the advertisement appears is listed in the right hand column.

If the offer selected is listed as "free," all you have to do is to send in the correctly marked coupon. If there is a slight charge (usually only 3 cents and rarely more than 10 cents to cover the cost of mailing bulky catalogs, booklets or samples), be sure to include the correct amount with the coupon. When postage stamps are used instead of cash be sure to send only U. S., because foreign stamps are not accepted for postage in this country.

Remember that the MI Readers' Service Bureau was started for your benefit. Use it and profit thereby.

Offer No.	Firm	Type of Business	Offer Made	Charge	Ad Appears on Page
1	Ace Tool Co.	Tools	Circular	Free	19
2	Allied Radio Corp.	Radio	Catalog	Free	136
3	American School	School	Book	Free	15-16-27
4	American School of Photography	School	Booklet	Free	140
5	Atlas Press Co.	Tools	Catalog	Free	23
6	Charles Atlas	Physical Training	Book	Free	21
7	Aurora School of Photo-Engraving	School	Booklet	Free	16
8	Bass Camera Co.	Cameras	Bargaingrams	Free	26
9	Bausch & Lomb Optical Co.	Microscopes	Booklet	Free	139
10	Benjamin Air Rifle Co.	Firearms	Specifications and Targets	Free	140
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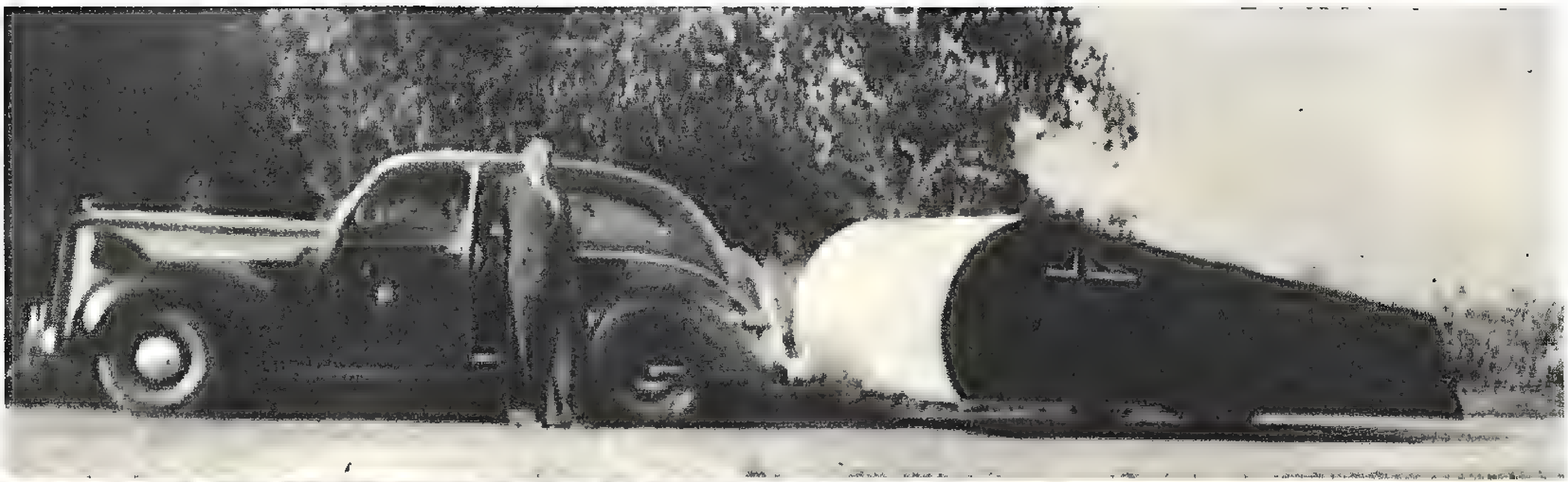
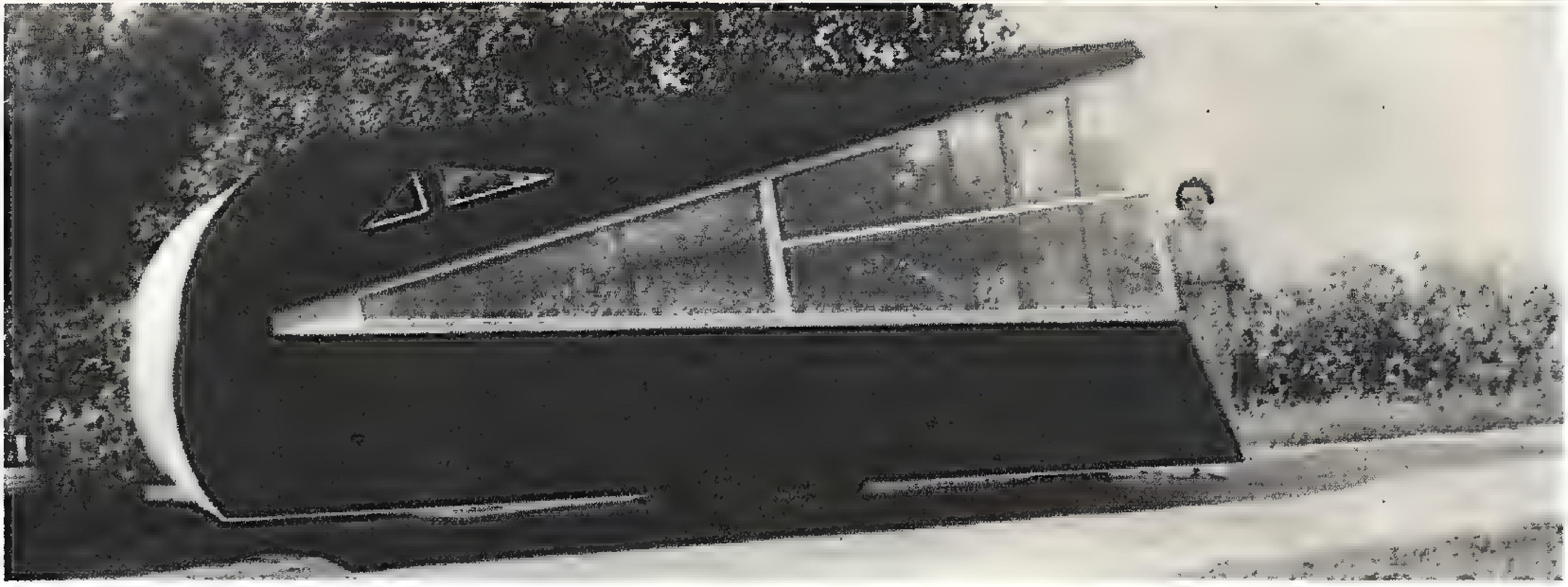
Dual-Purpose House Trailer Features Folding Top





A DUAL-purpose house trailer (lower photo) which features an upper section that can be folded flat when traveling (top), enabling the driver of the tow car to see back over the road by means of his rear view mirror, has been developed by C. E. Downing, of Pemberville, Ohio. The upper part of the novel trailer can be unhinged so that the lower section can be used as a light commercial carrier for transporting merchandise.

Pendulum Measures Earth's Rotation On Axis

SUSPENDED in an unoccupied 120-foot elevator shaft at Mundelein College in Chicago, Ill., a 30-pound chromium plated ball is being used to demonstrate and measure the rotation of the earth on its axis. The recording of the azimuth of the ball's swing is made by means of an electric spark jumping from a platinum point on the bottom of the ball to a brass ring inlaid in the top of a table placed underneath. The spark makes a hole in waxed paper on the table and by comparing the holes made at half hour intervals and then making the necessary calculations, the desired measurements can be determined. The photo shows Miss Lucille Trudeau releasing the pendulum ball.

KAN.
MO.
ILL
KY
VA.
N.C.
OKLA
TENN.
S.C.
ALA
ARK.
GA.
MISS
TEXAS
LA.
FLA.
TAMPA
GULF of MEXICO
ATLANTIC OCEAN

Rug Map Teaches Geography

CONSTITUTING a novel method of teaching geography to youngsters, a new playroom rug features a large map of the United States. Characteristic industries and the capitol of each state are plainly indicated.

Device Dispenses Oil On Receipt Of Coin

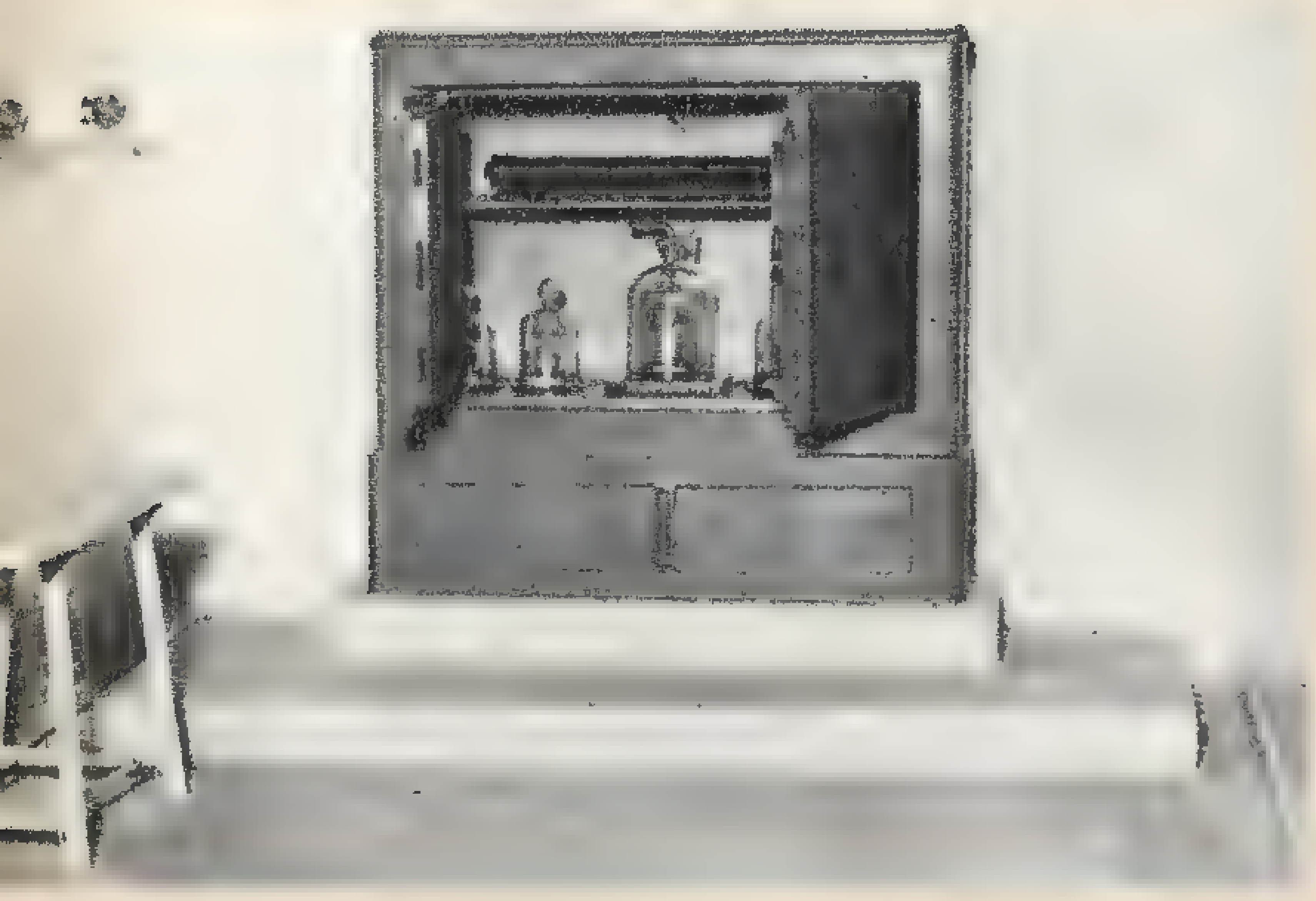
EQUIPPED with two slug ejectors to prevent fraud, a new automatic oil vending machine dispenses bulk oil upon receipt of the proper coin. Holding 60 gallons, the machine can be adjusted to dispense any desired quantity.

Vacuum Cleaner Has Reel To Wind Cable

A NEWLY developed vacuum cleaner is equipped with a built-in spring reel which stores 25 feet of cable, enabling the operator to use the cleaner at points remote from an electrical outlet. A special trigger permits automatic rewinding of the cable when desired.

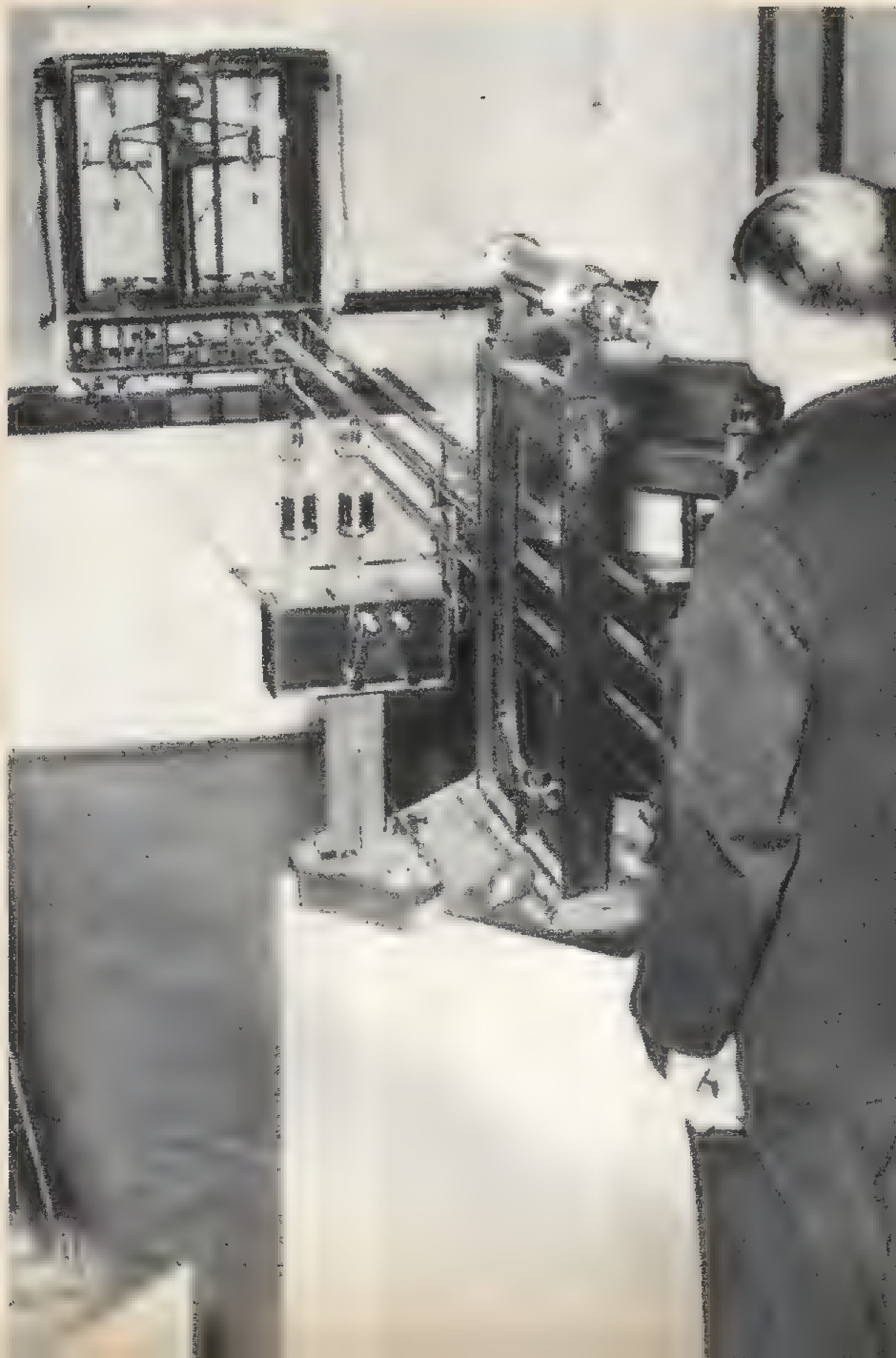
Albert Perard, director of the French Bureau of the International Committee of Weights and Measures, is shown holding the exact replica of the standard meter, which, with other weights and measures of solid platinum, are kept locked in airtight vaults in the Pavillon de Breteuil at Sevres, France. There are but three keys to the vaults—two in France and the other in Rome. These three keys must be used collaboratively to open the vaults.

MAINTAINING METRIC STANDARDS



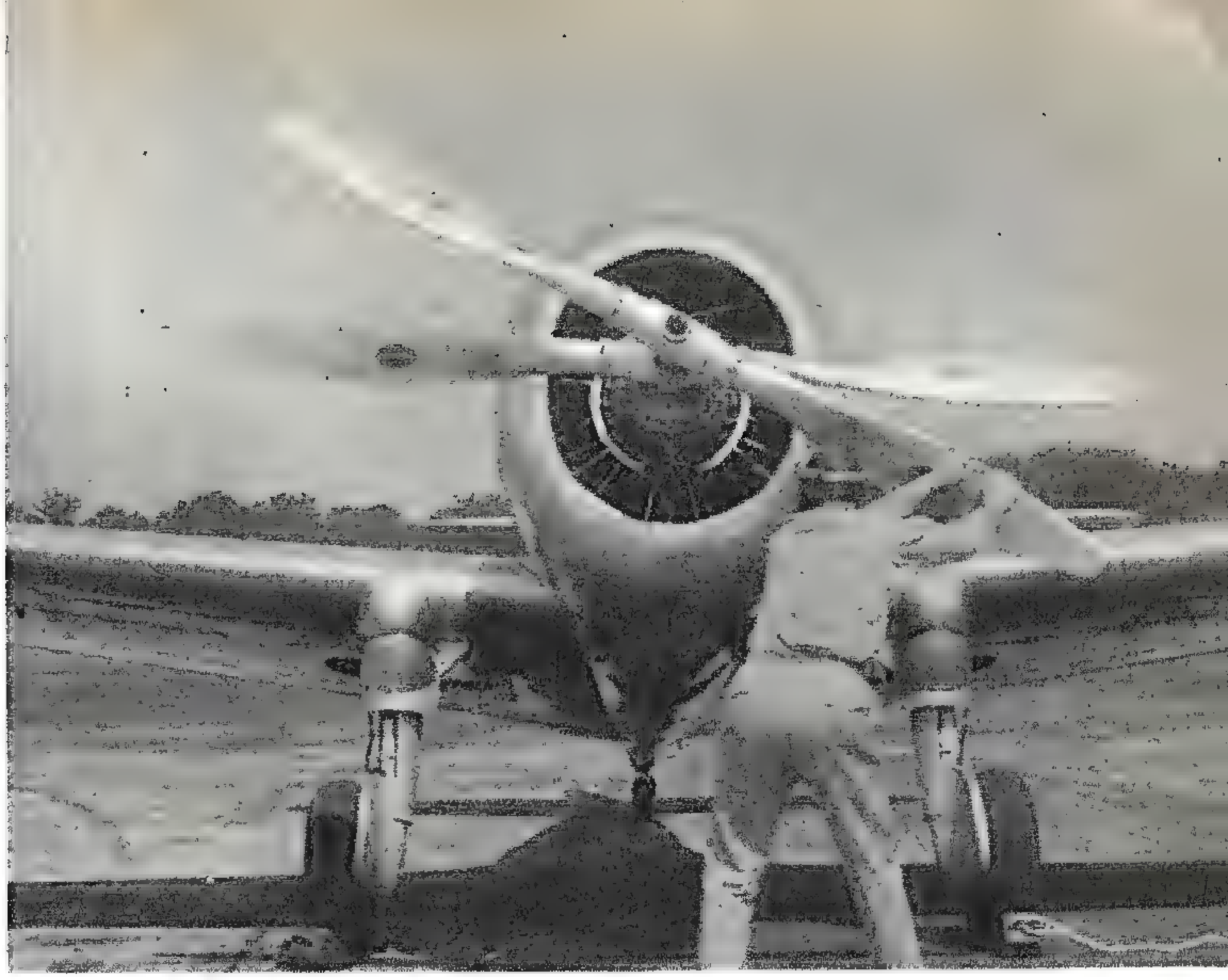
Above is shown one of the airtight steel vaults used to house the solid platinum official meter and kilogram weights. Note the glass bell jars under which the weights are kept. Below—Delicate instruments are used to check surveyors' four-meter sticks. Almost unbelievable accuracy is necessary when making comparisons with the standard measurements and weights.

Below is shown an extremely delicate balance which can check a one kilogram weight to within .01 milligram. This balance is kept at the Pavillon de Breteuil, Sevres, France, in an airtight steel vault of constant temperature. In this vault, carefully guarded, are kept the standard meter and kilogram.



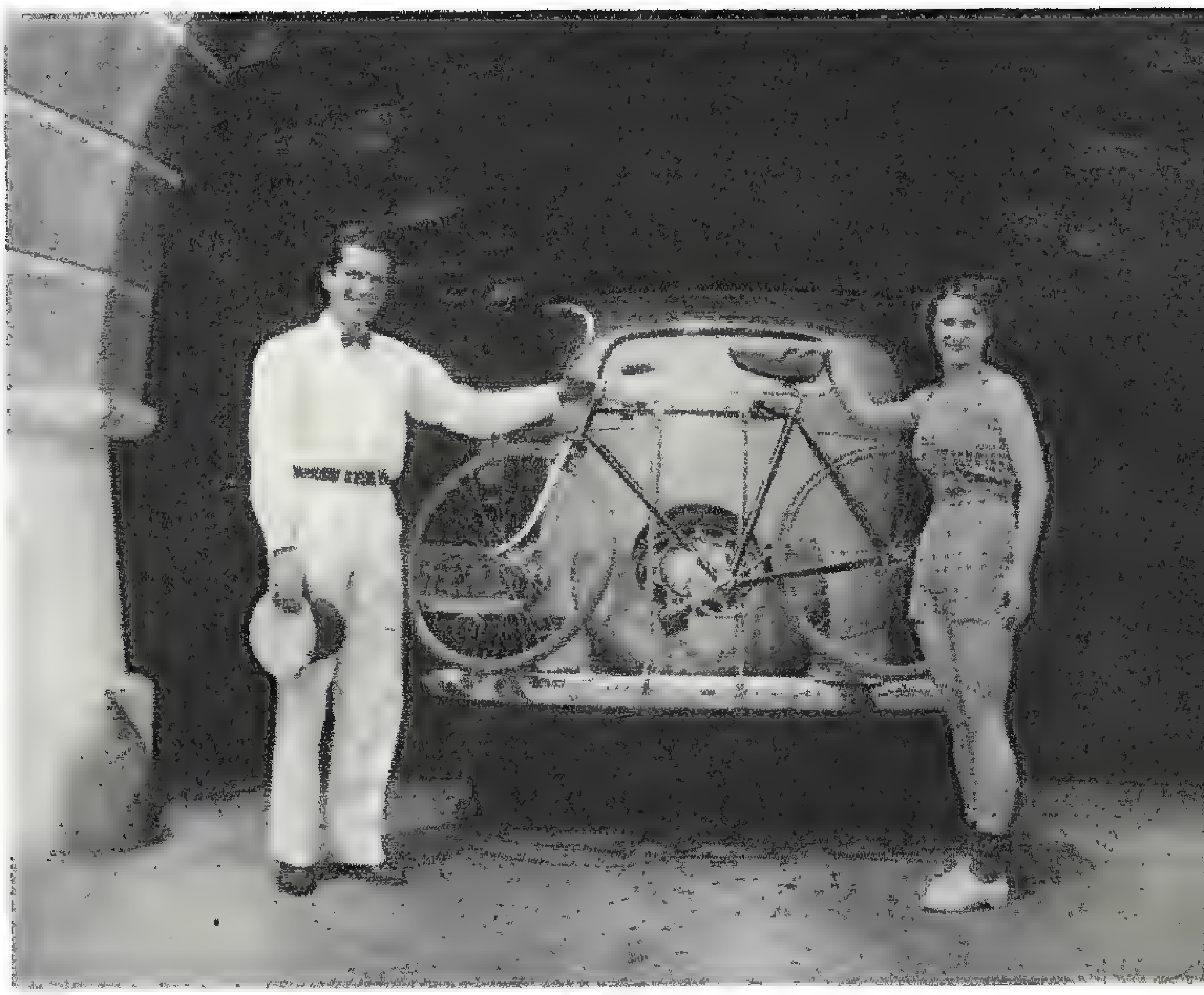
Airplane's Propellers Mounted Tandem

INSTALLED on a Curtiss pursuit plane, tandem-mounted propellers which revolve in opposite directions are being experimented with by the Army Air Corps. The main advantages claimed for the unusual mounting are the minimizing of engine torque and a reduction in the diameter of the propellers without impairing efficiency at high speeds. Tandem-mounted propellers helped an Italian plane set a world's speed record of 440 m.p.h. in 1934.



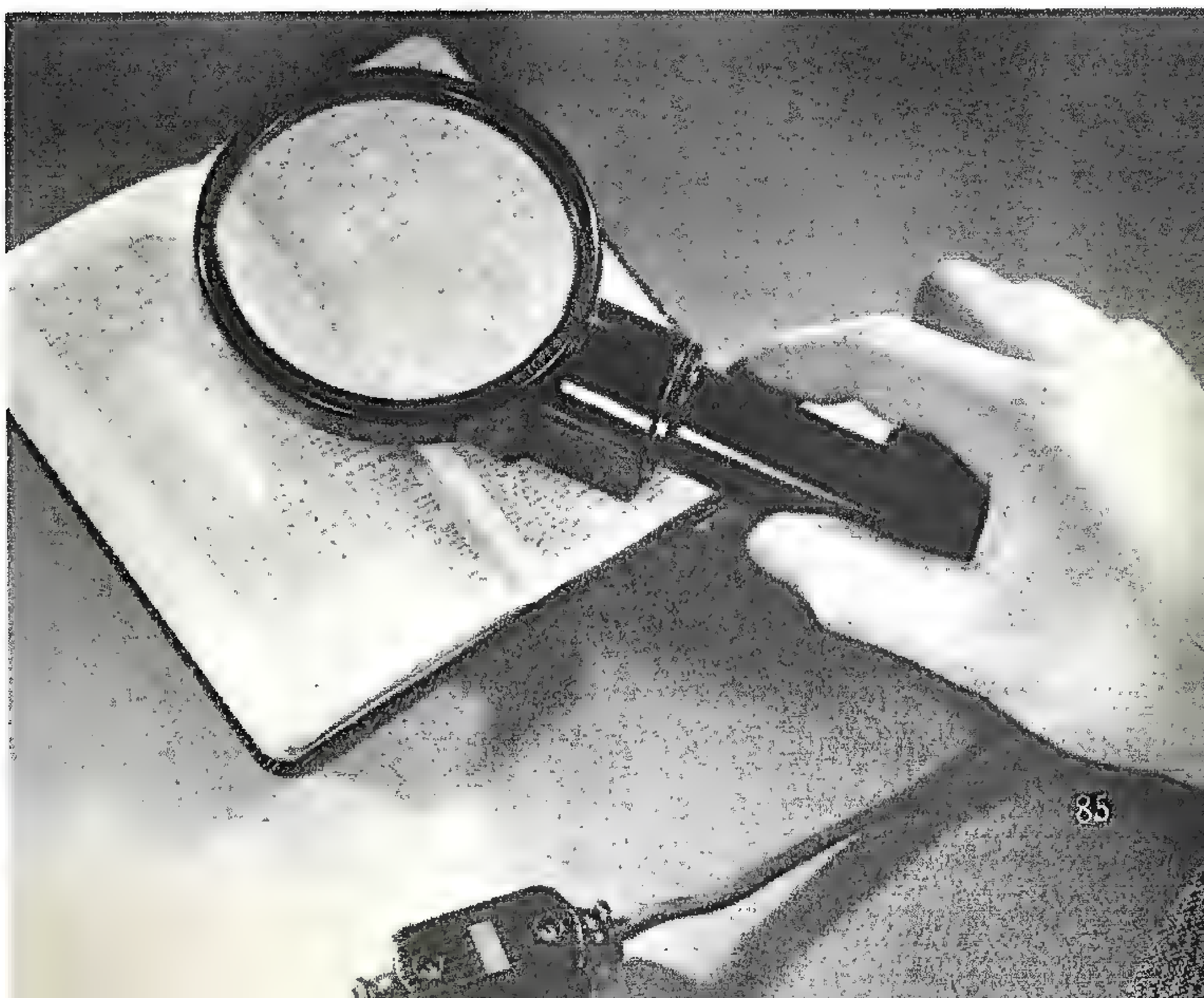
Bicycle Carrier Fits On Auto Bumper

MOUNTED without tools in less than one minute, a new bicycle carrier enables the car-owning cycling enthusiast to carry his bike to far away points on the rear bumper. The carrier features grips which are padded to prevent scratching of the bike or bumper. Regulated by screw pressure, the grips hold the bike firmly irrespective of the speed at which the car is traveling. As shown in the photo, the grips are within easy reaching distance, facilitating the mounting or removal of the bike. The carrier is light in weight.



Magnifying Glass Has Concealed Lamp

OPERATED by either A.C. or D.C. current, a new electric reading lamp features a concealed bulb that illuminates the entire field of vision. The lamp has a large magnifying lens that completely spans an ordinary newspaper column, thus aiding persons whose sight has become impaired. The housing of the new reading aid is made of a molded material which combines utility with attractiveness.



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BULGARIA
IRISH FREE STATE

ITALY
COLUMBIA
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PERU
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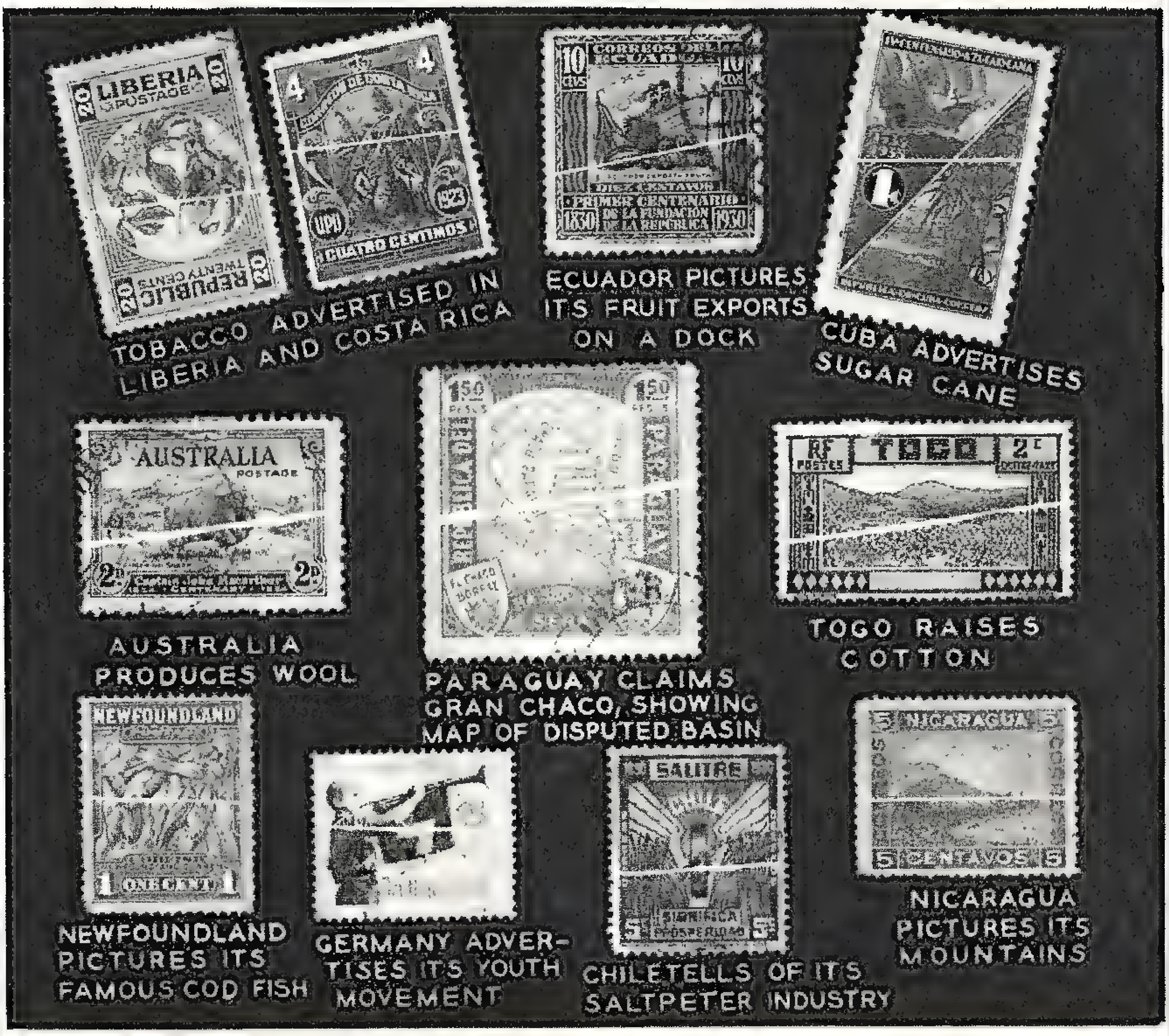
PORTUGAL

POSTAGE STAMPS AS PROPAGANDA

by MONTGOMERY MULFORD


TOBACCO ADVERTISED IN LIBERIA AND COSTA RICA

ECUADOR PICTURES ITS FRUIT EXPORTS ON A DOCK

CUBA ADVERTISES SUGAR CANE

AUSTRALIA PRODUCES WOOL

PARAGUAY CLAIMS GRAN CHACO, SHOWING MAP OF DISPUTED BASIN

TOGO RAISES COTTON

NEWFOUNDLAND PICTURES ITS FAMOUS COD FISH

GERMANY ADVERTISES ITS YOUTH MOVEMENT

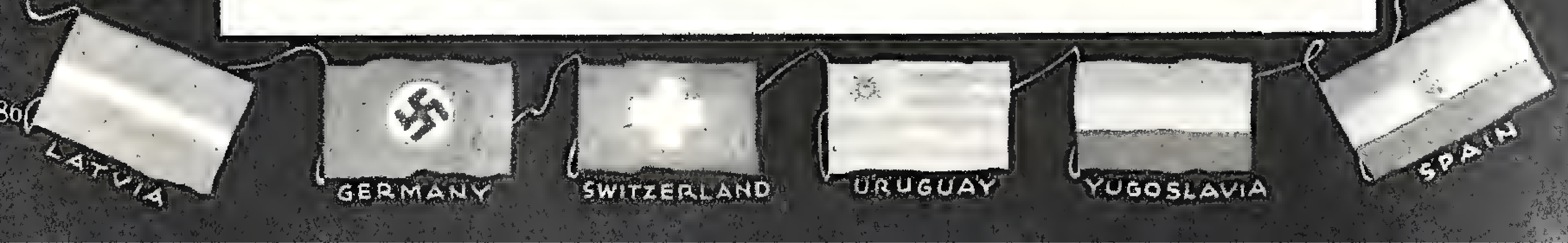
CHILE TELLS OF IT'S SALTPETER INDUSTRY

NICARAGUA PICTURES ITS MOUNTAINS

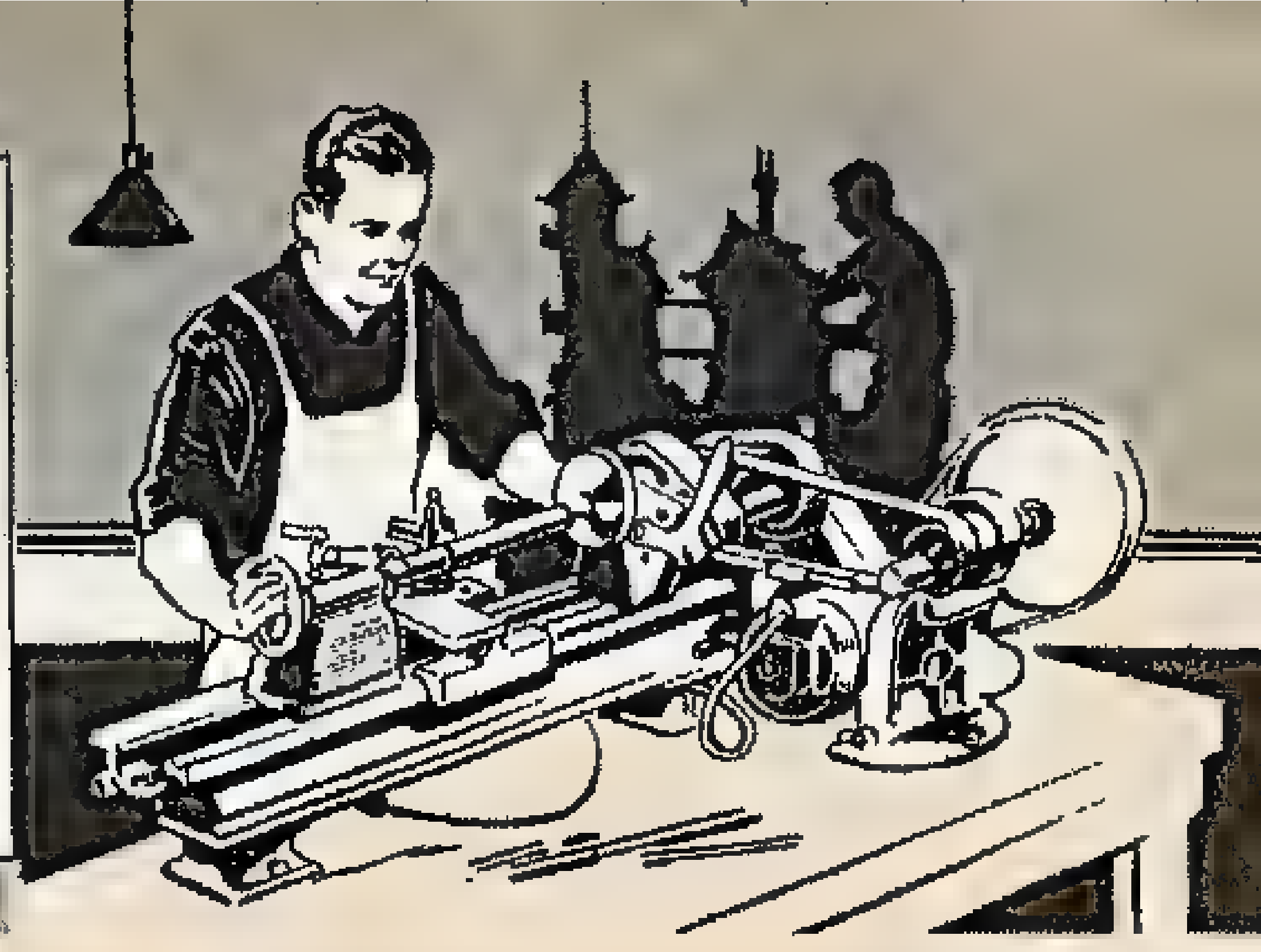
THERE is no doubt that today postage stamps are being used for propaganda purposes. Because they serve governments in this way, new stamps are constantly being issued. Each year many new issues appear, and a vast majority of them suggest or preach, some political ideal.

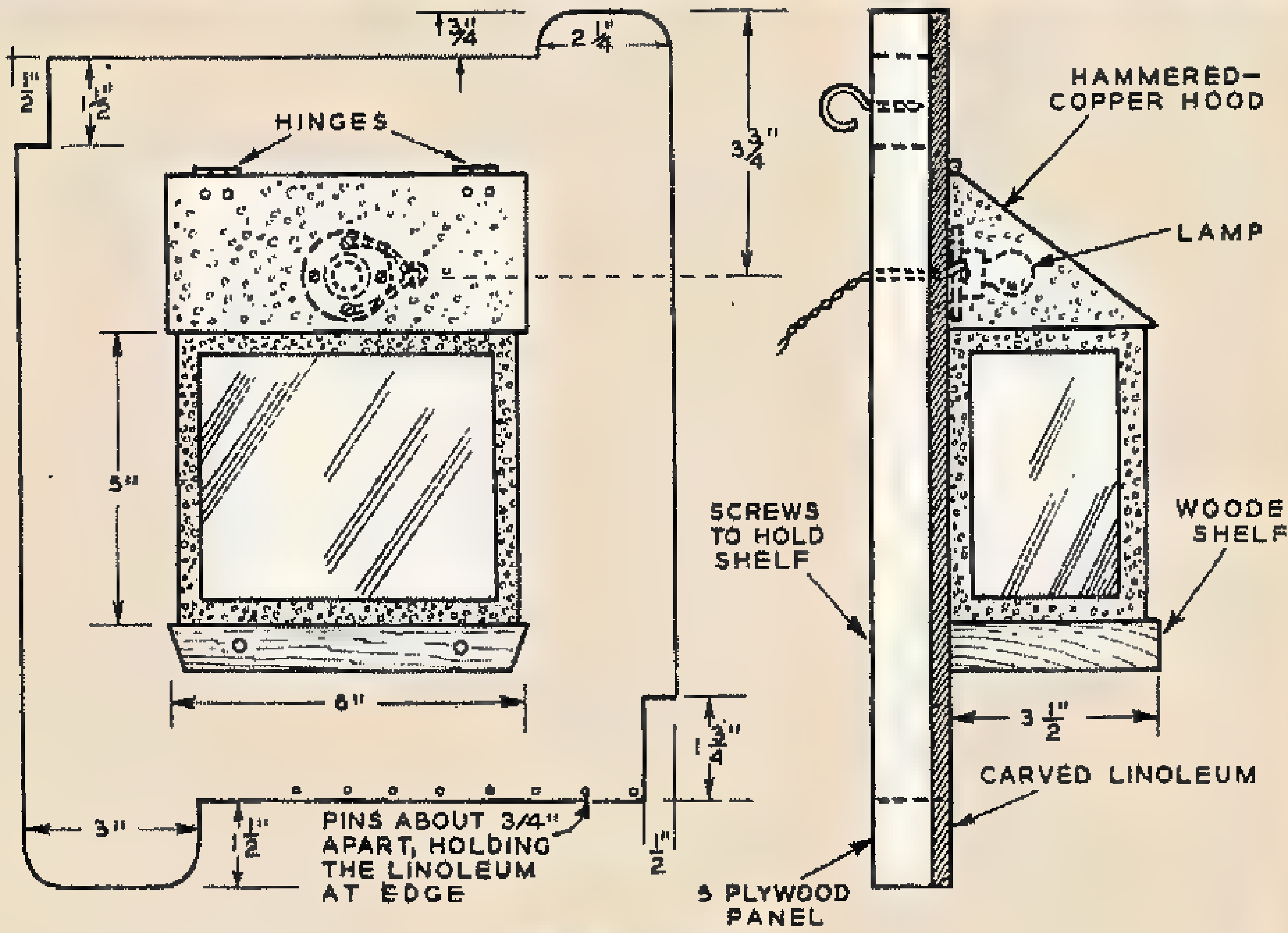
Many nations have been accused of increasing the postal paper deluge; among the topnotchers of late, stands Italy. While the United States will issue one stamp to commemorate some purpose or incident—or infrequently produce a short series—a country such as Italy will bring out a long suit of stamps. It will include both complete sets of postage and airmail stamps. Sometimes a special delivery airmail is added. Thus Italy deluges not only its own country, but foreign lands with its political concepts—because quantities of stamps are exported throughout the world for collectors. Soviet

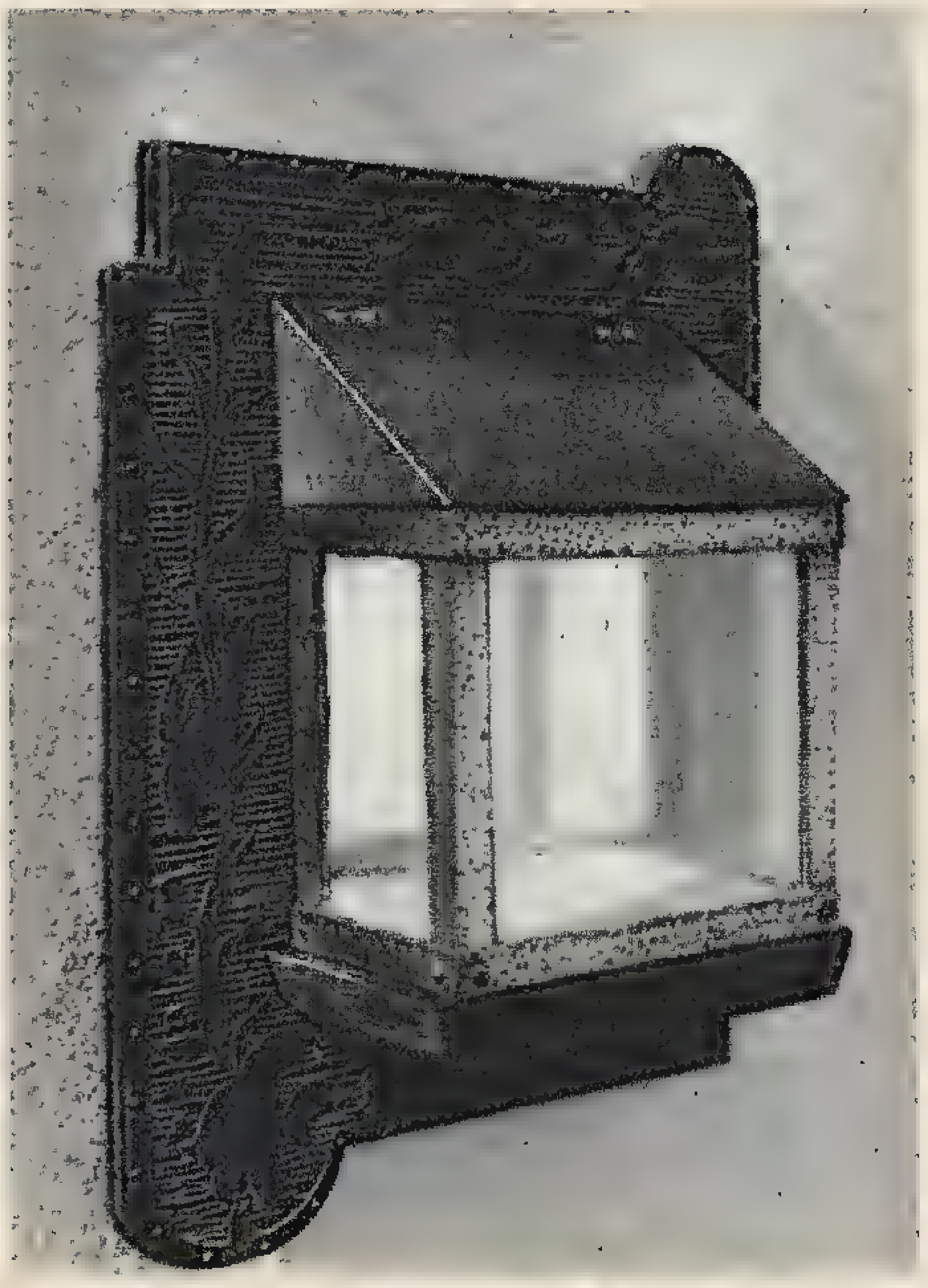
[*Continued on page* 135]

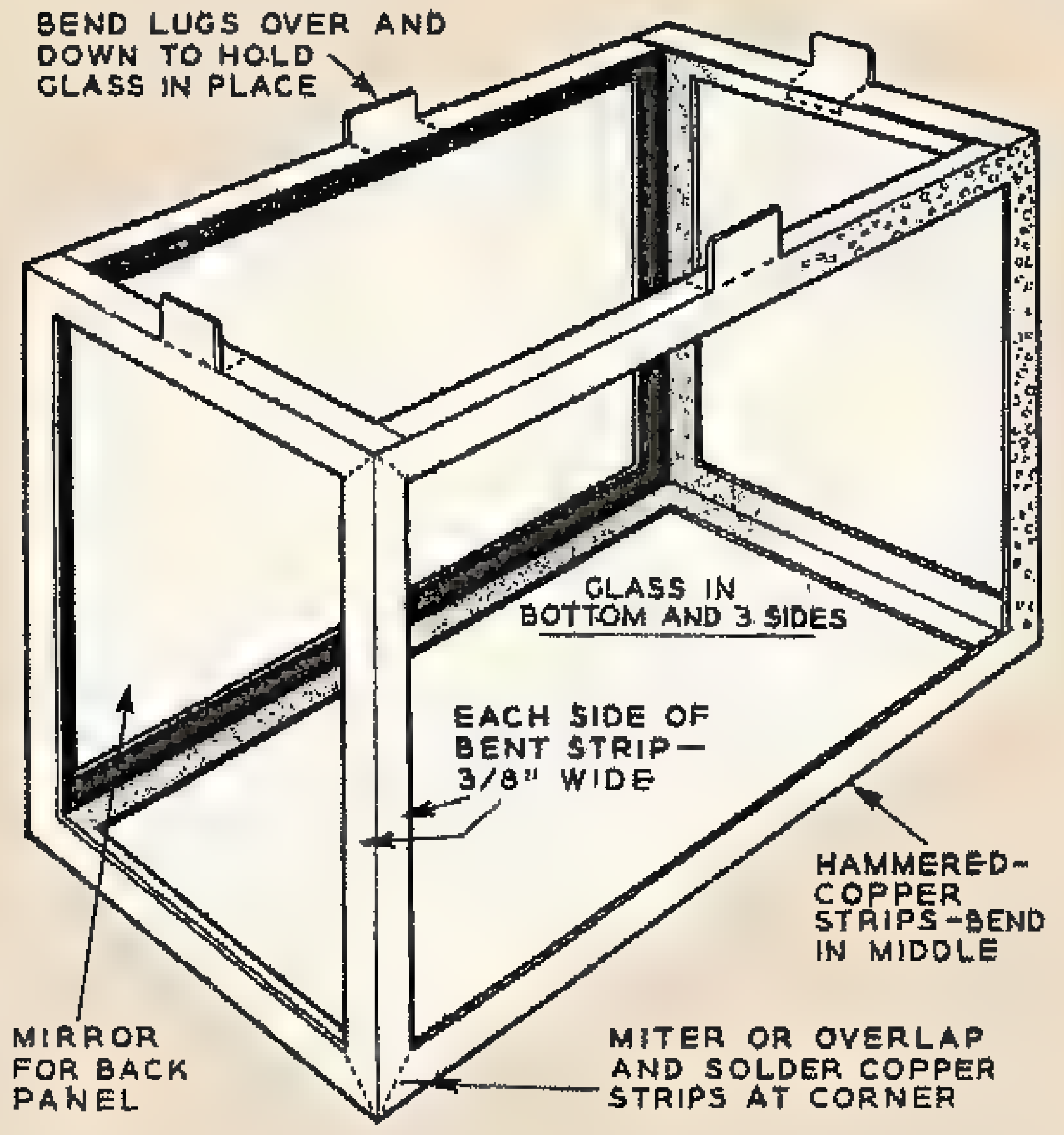

LATVIA
GERMANY
SWITZERLAND
URUGUAY
YUGOSLAVIA
SPAIN

CRAFTS AND HOBBIES




3/4"
2 1/4"
1 1/2"
1 1/2"
HINGES
3 3/4"
5"
6"
1 3/4"
3"
1 1/2"
PINS ABOUT 3/4" APART, HOLDING THE LINOLEUM AT EDGE
1/2"
HAMMERED-COPPER HOOD
LAMP
SCREWS TO HOLD SHELF
WOODEN SHELF
3 1/2"
CARVED LINOLEUM
5 PLYWOOD PANEL




BEND LUGS OVER AND DOWN TO HOLD GLASS IN PLACE
GLASS IN BOTTOM AND 3 SIDES
EACH SIDE OF BENT STRIP—3/8" WIDE
HAMMERED-COPPER STRIPS—BEND IN MIDDLE
MIRROR FOR BACK PANEL
MITER OR OVERLAP AND SOLDER COPPER STRIPS AT CORNER

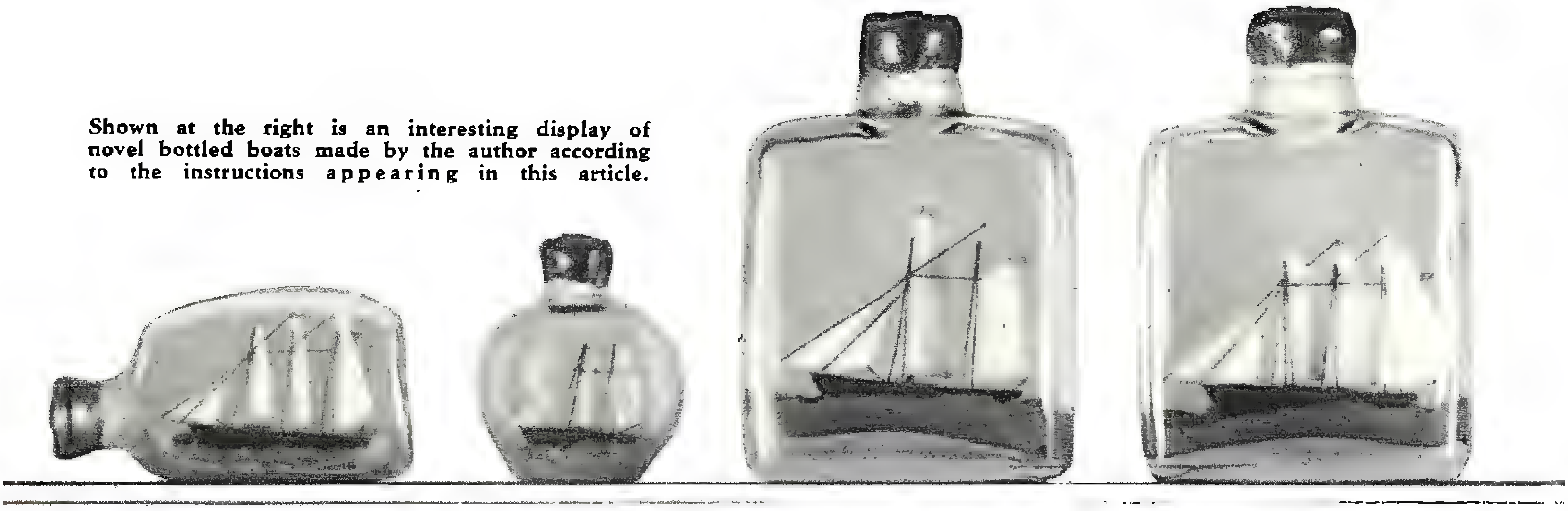
BUILD THIS ATTRACTIVE ILLUMINATED WALL AQUARIUM

A NOVEL illuminated wall aquarium in which the lamp warms the water to a temperature suitable for tropical fish can easily be built by the home craftsman at a total cost for materials of about one dollar.

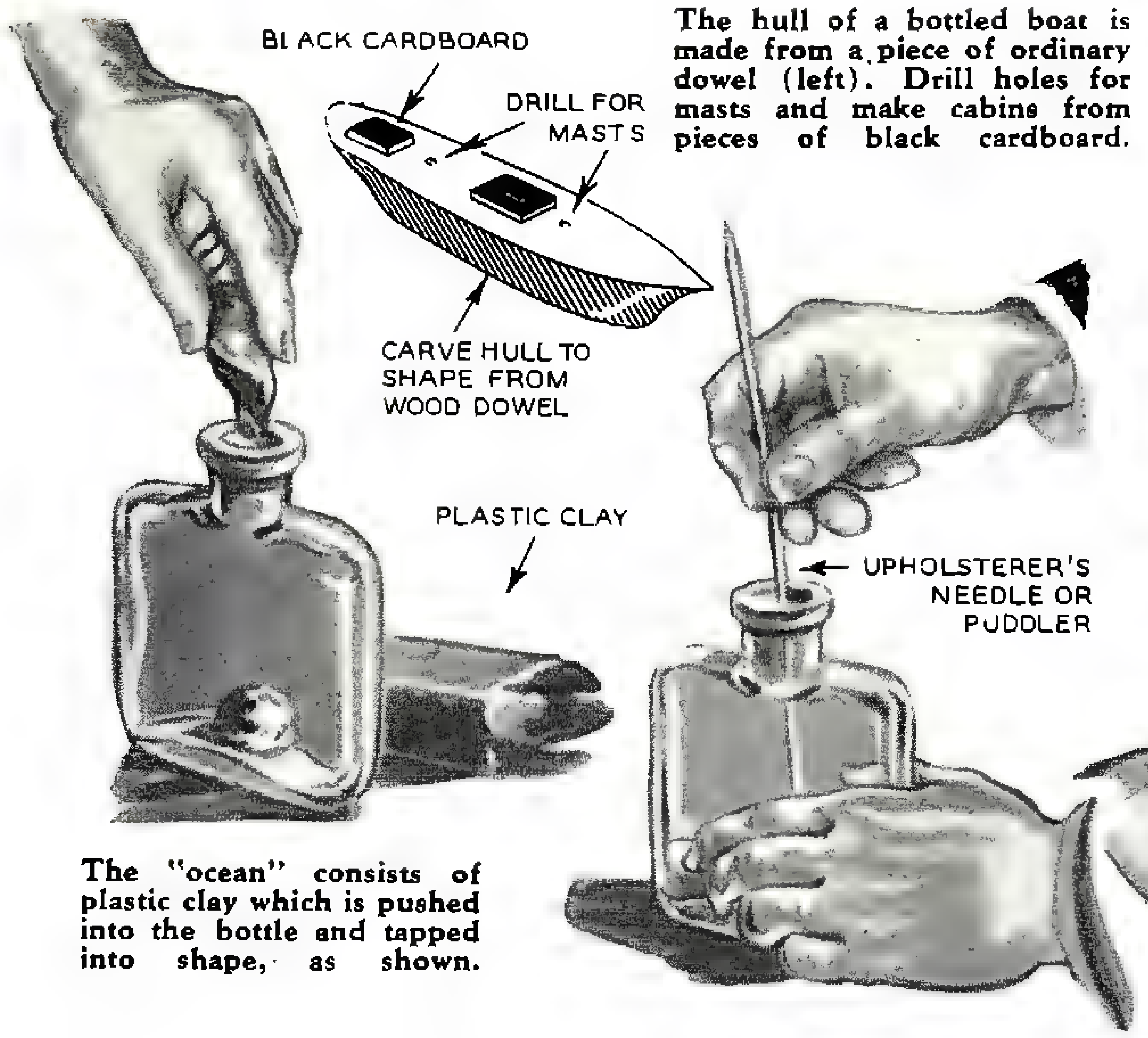
The backboard is made from a piece of 5-ply panel, 15″x11″, cut to the shape of the diagram. A piece of linoleum, carved with a suitable design, is fastened to the face of the panel with round-headed ornamental brass pins. Near the lower end of the panel, a wooden shelf 6″x3½″ is attached by means of large wood screws. Above the shelf, allowing just enough space for the aquarium box, is mounted an 110-volt candelabra light socket, over which a hood made from hammered copper is fastened on hinges. The electric bulb is a 7½-watt "night" light.

[*Continued on page* 135]

Shown at the right is an interesting display of novel bottled boats made by the author according to the instructions appearing in this article.

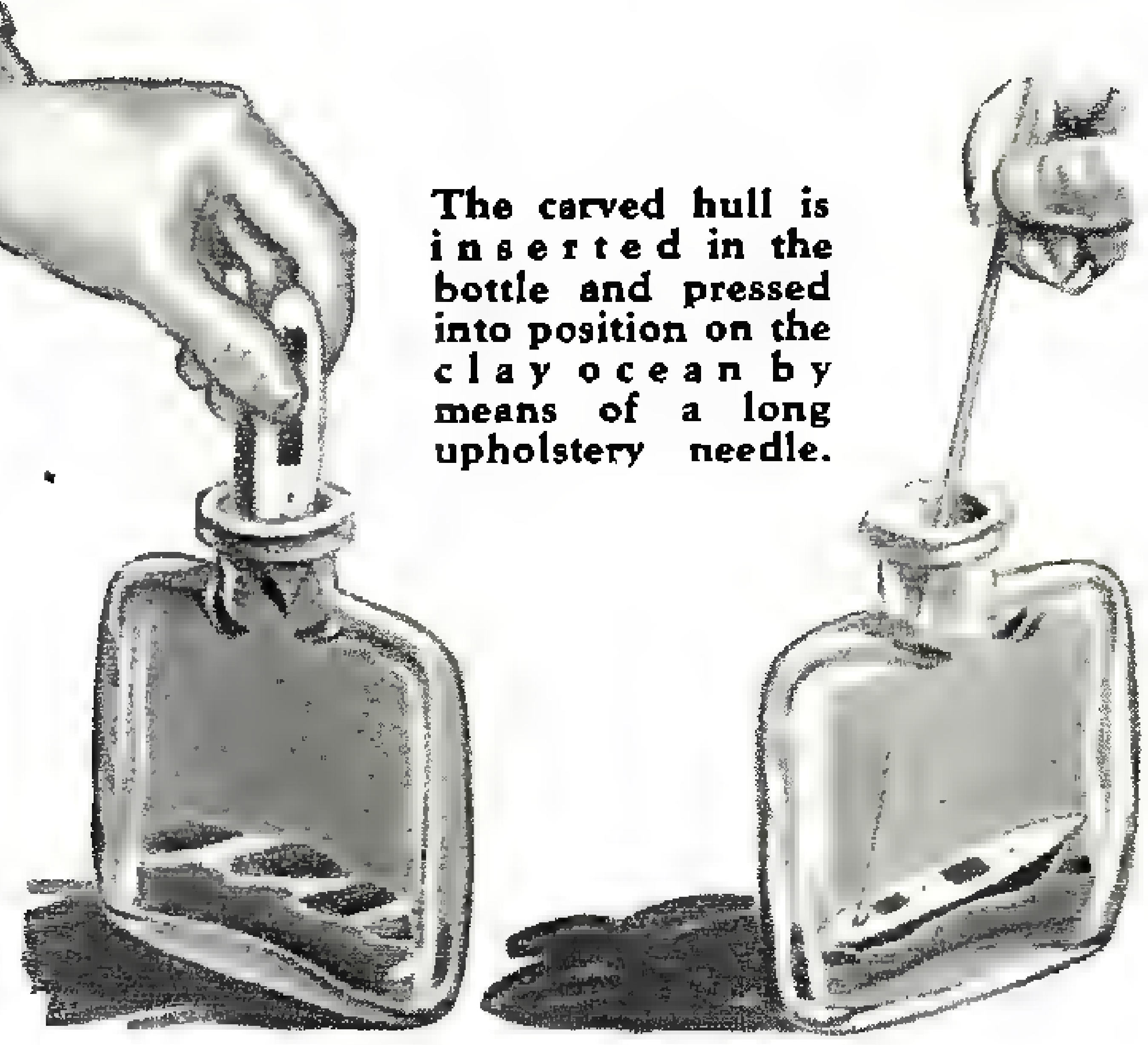


Building Bottled BOATS


BLACK CARDBOARD
DRILL FOR MASTS
CARVE HULL TO SHAPE FROM WOOD DOWEL
PLASTIC CLAY
UPHOLSTERER'S NEEDLE OR PUDDLER

The hull of a bottled boat is made from a piece of ordinary dowel (left). Drill holes for masts and make cabins from pieces of black cardboard.

The "ocean" consists of plastic clay which is pushed into the bottle and tapped into shape, as shown.



The carved hull is inserted in the bottle and pressed into position on the clay ocean by means of a long upholstery needle.

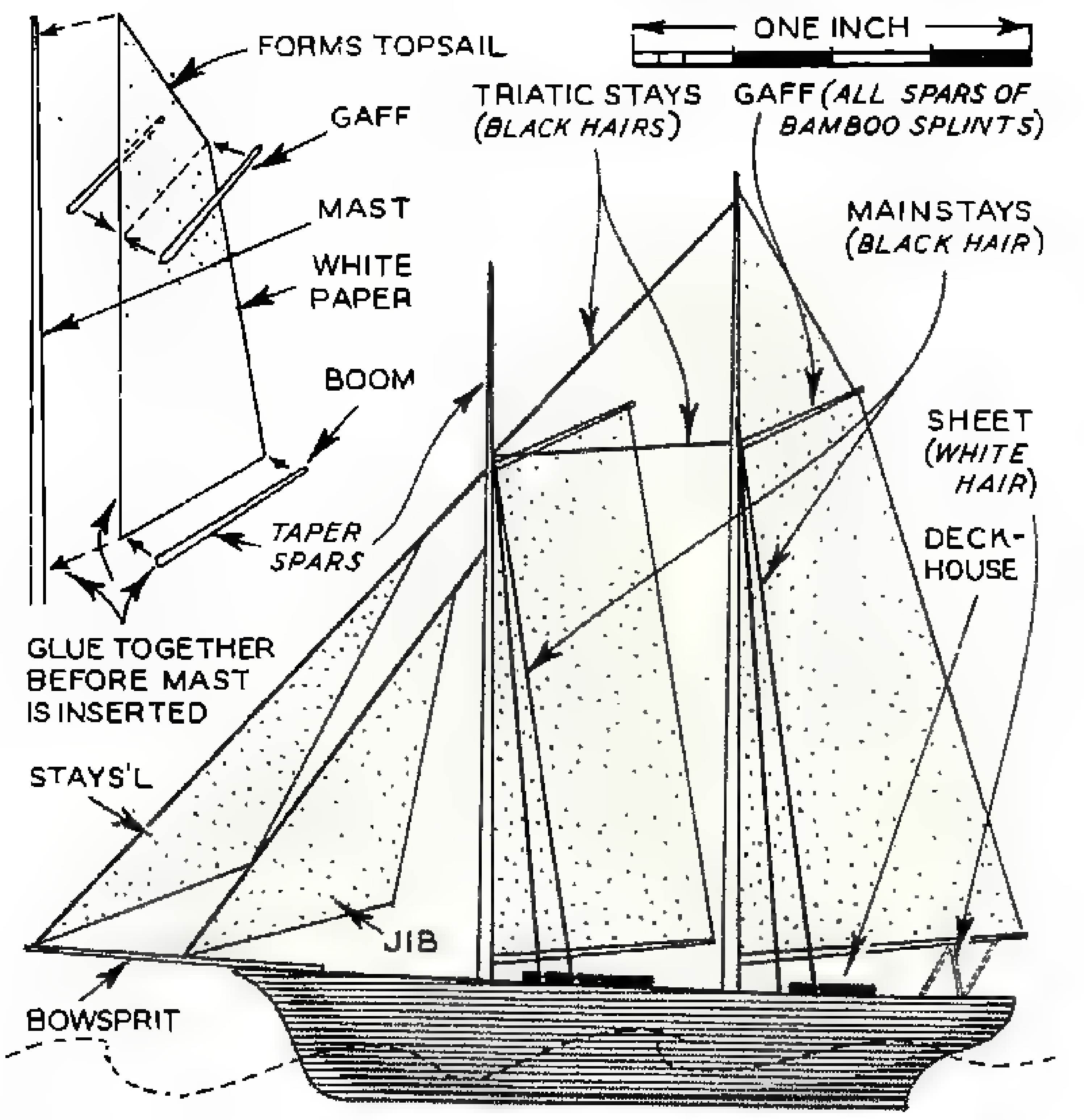

ONE INCH
FORMS TOPSAIL
GAFF
MAST
WHITE PAPER
BOOM
TAPER SPARS
GLUE TOGETHER BEFORE MAST IS INSERTED
STAYS'L
JIB
BOWSPRIT
TRIATIC STAYS (BLACK HAIRS)
GAFF (ALL SPARS OF BAMBOO SPLINTS)
MAINSTAYS (BLACK HAIR)
SHEET (WHITE HAIR)
DECK-HOUSE

FIG. I - TWO-MASTED SCHOONER RIG (*ACTUAL SIZE*)

Shown above are the hull outline and sail patterns of a two-masted schooner which, because of its simplicity, should be your first bottled boat project. See text for details.

by Van Ness Taylor

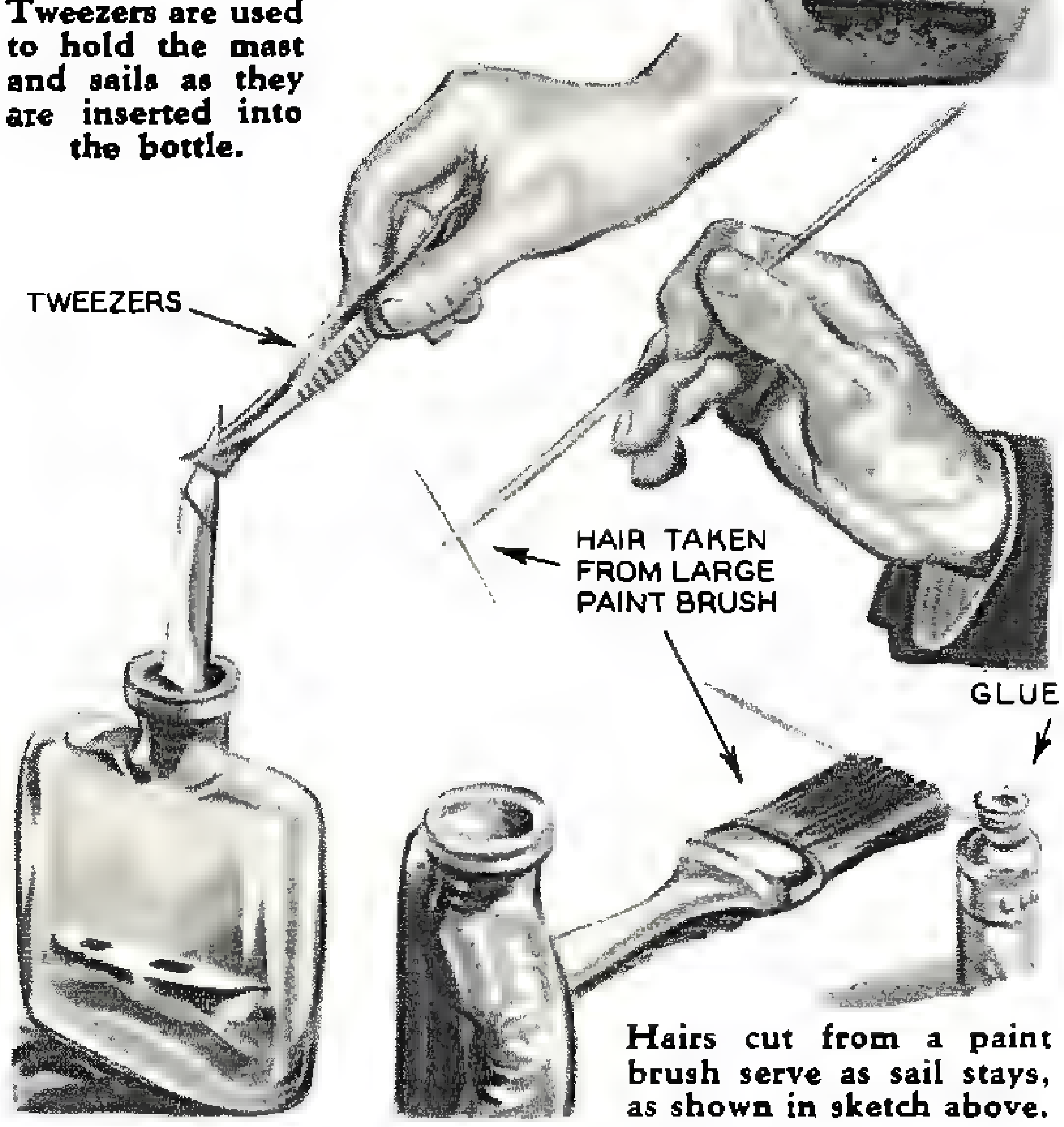
THE captivating hobby of building model boats within the confines of small bottles is not as difficult as it appears at first glance. All that is needed is a steady hand and a little patience. With a surprisingly small amount of practice you can decorate your mantlepieces, tables, settees and so forth with a large variety of ships in bottles of every size or shape. Your fifth boat will be presentable, your tenth satisfactory and your twenty-fifth salable. Your

initial investment will run about ten dollars for the first fifty boats, whether for yourself or your kiddies, but after that the cost of production is practically nothing.

First buy a dozen or so flat-sided, clear half-ounce bottles. Other essential materials are: one long and thin upholstery needle, a pound of plastic or non-hardening clay, a tube of quick-hardening, transparent glue, a package of bamboo strips obtainable from any model airplane supply house, a knife, a dowel of wood of a diameter which will enable it to slip through the neck of your bottle, one pair of tweezers, some white writing paper for sails, some colored paper for flags and pennants, some paints, a large paint brush, a shaving brush, a number 70 drill, a strip of black cardboard, and a pair of scissors.

When making square-rigged bottled boats, the sails should be built up as shown in sketch at right. Below—a single-masted exhibit.

Make your first boat a two-masted schooner, but before starting get a silhouette of such a vessel to follow. An illustration from a book on ships is the best, but one from a magazine will do.


TWEEZERS
HAIR TAKEN FROM LARGE PAINT BRUSH
GLUE

Tweezers are used to hold the mast and sails as they are inserted into the bottle.

Hairs cut from a paint brush serve as sail stays, as shown in sketch above.

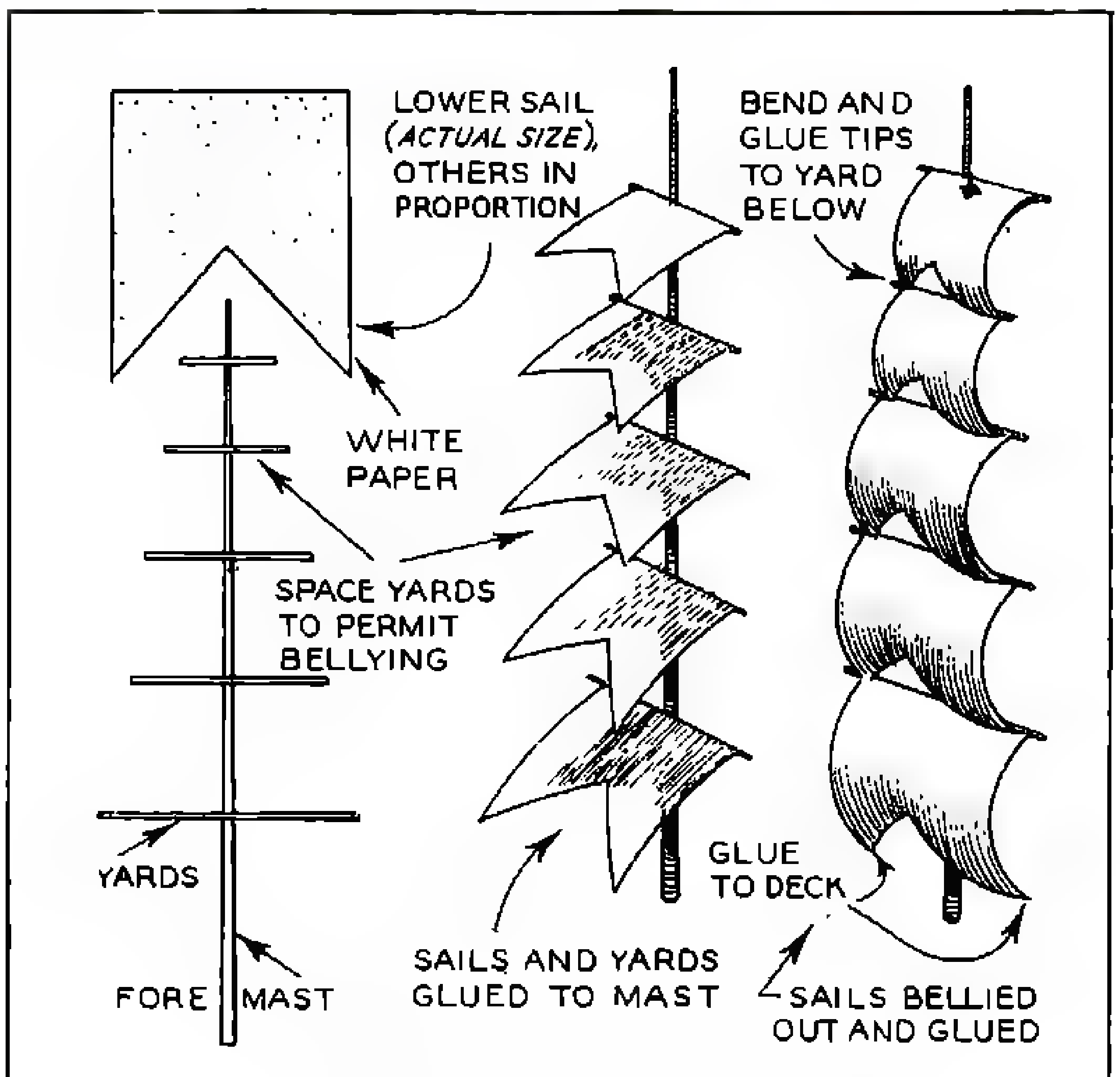

LOWER SAIL (ACTUAL SIZE), OTHERS IN PROPORTION
BEND AND GLUE TIPS TO YARD BELOW
WHITE PAPER
SPACE YARDS TO PERMIT BELLYING
YARDS
FORE MAST
SAILS AND YARDS GLUED TO MAST
GLUE TO DECK
SAILS BELLIED OUT AND GLUED

FIG. 2 - SQUARE RIG DETAILS

Begin with the hull, which is carved out of a dowel. Fashion the bow and stern with some care and shave the deck down reasonably smooth, but disregard the bottom as it will never show. Drill two holes in the hull in the proper locations for the masts in accordance with the picture you are following. Now cut two small oblong bits of black cardboard and glue them into place for deck houses. Then paint the hull whatever color you prefer and set it aside to dry.

While the paint is drying make the "ocean" out of clay. Twist off little lumps of it and wheedle them between thumb and forefinger until they will fit through the neck of the bottle. Drop them in one at a time and tap each one down fairly solidly with any blunt instrument, such as the butt of a knitting needle. Your ocean should cover the entire bottom of the bottle, about an eighth of an inch in depth.

[*Continued on page* 134]

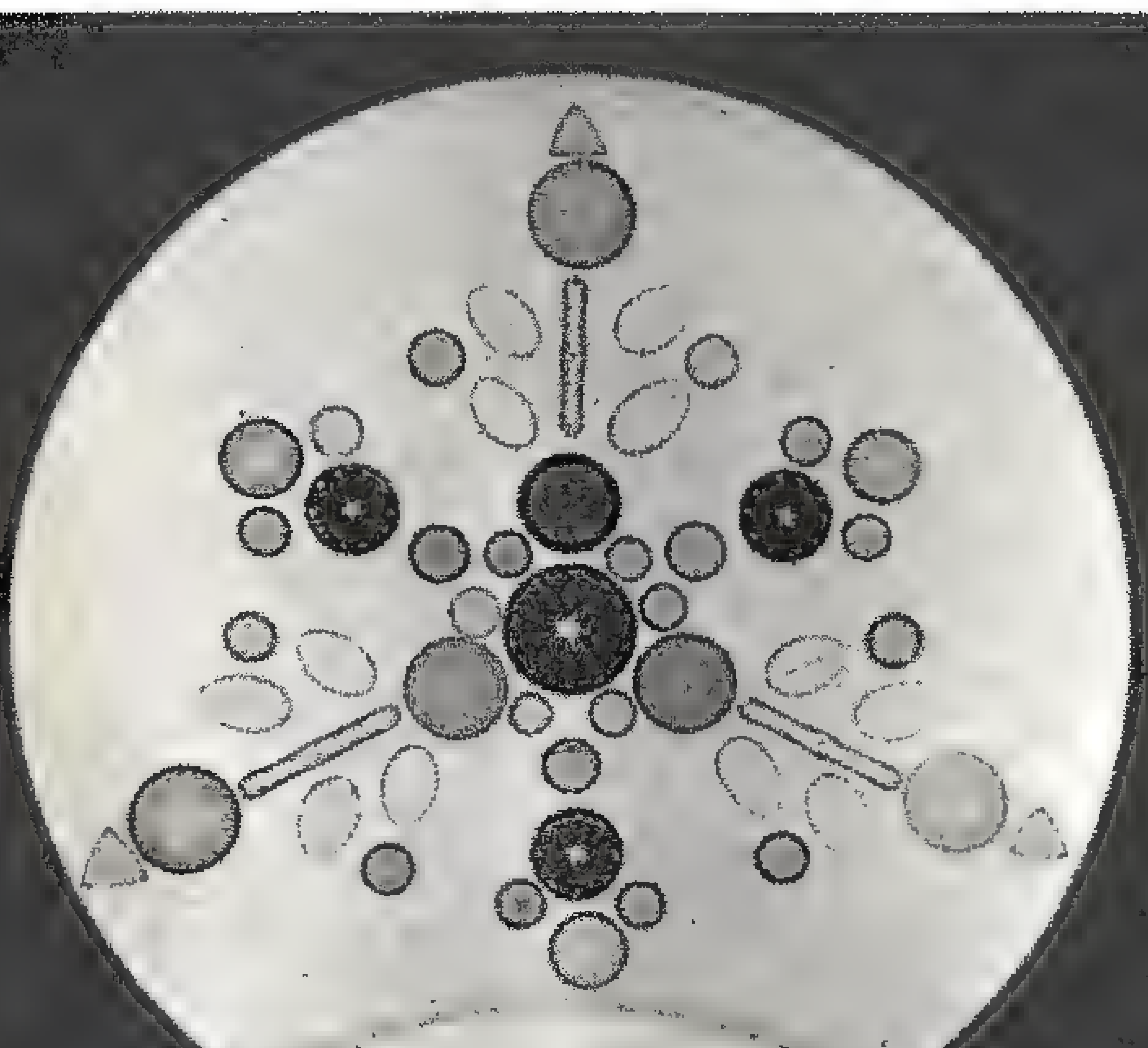
Make Diatom Slides

BY FAR the most popular subject for study under the microscope is that great group of minute, one-celled plants, the *diatoms.* A glance at the illustrations will show some of the reasons for this favoritism; the remarkable variety and large number of types—the beautiful symmetry of form and intricacy of design—and the small size which requires magnification in order that these features may be seen.

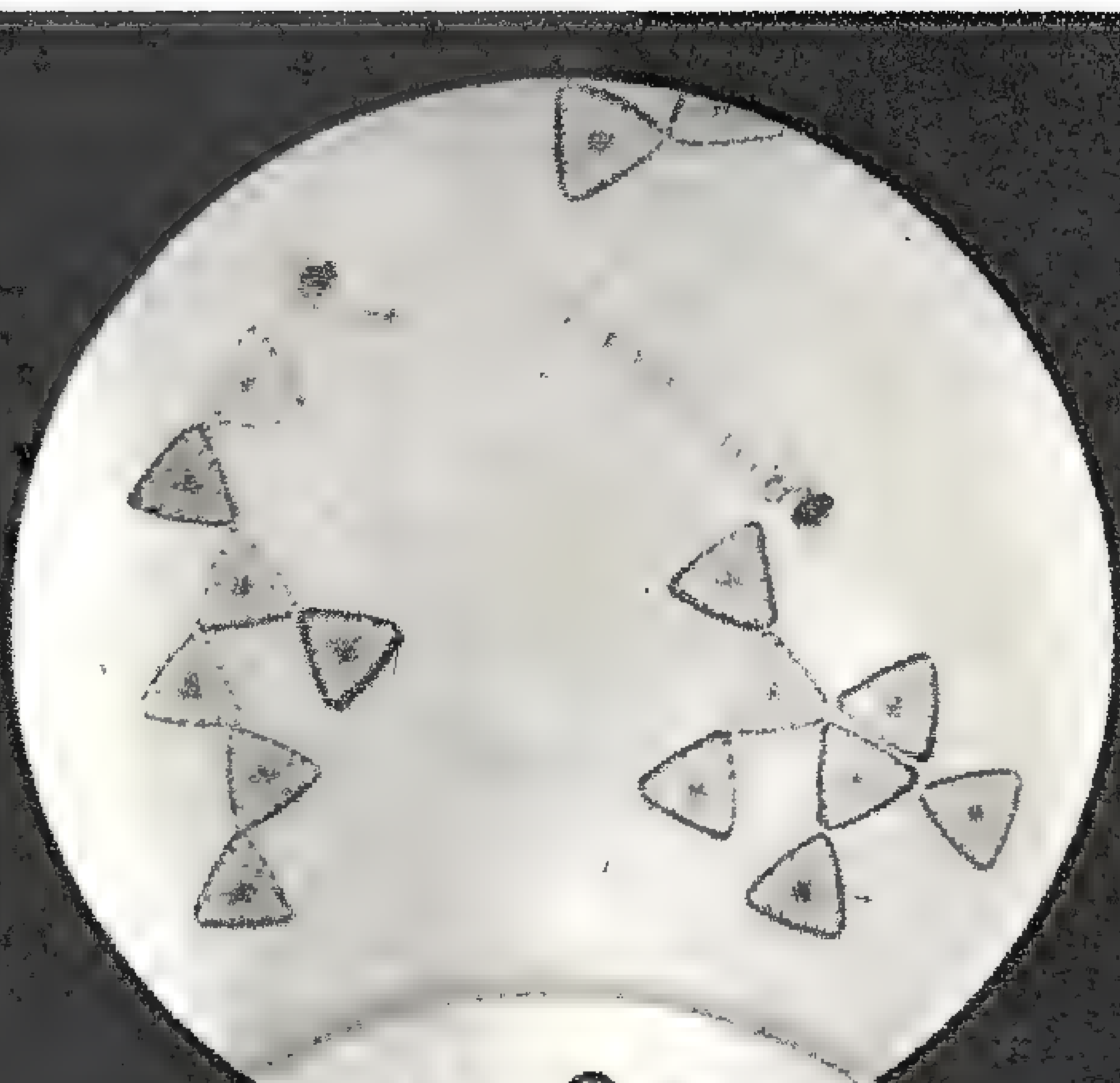
Many readers doubtless have seen diatom slides, though few know all of the kinds that are made. There is the species strew or spread slide, in which many examples of a single species are scattered at random all over the field of view; the locality strew, where numbers of different forms from the same geographic district are similarly displayed; circle slides, with different diatoms spaced out evenly in circular arrangement; exhibition slides, the selected types accurately positioned, one at a time, to make up ingenious patterns; the type slide, consisting of one or more rows of different species, accompanied by a key list giving names and localities; and finally the test slide, where mounts of certain preferred species are used in testing microscope lenses.

As a group, the diatoms make up one order of the class or plants known as green algae, larger and more familiar examples of which include pond scums and seaweeds. They occur all over the earth wherever there is water, salt or fresh, and their skeletal remains make up strata of rock as evidence of their abundance in past ages. One celebrated deposit of this material, known as diatomaceous earth or kieselguhr, is found at Richmond, Virginia, and there are many others. Since these formations may exceed three hundred feet in thickness, cover an extensive territory, and contain upwards of forty million diatom shells per cubic inch of earth, one would need some astronomical computing devices even to estimate the number of fossil diatoms in a given area.

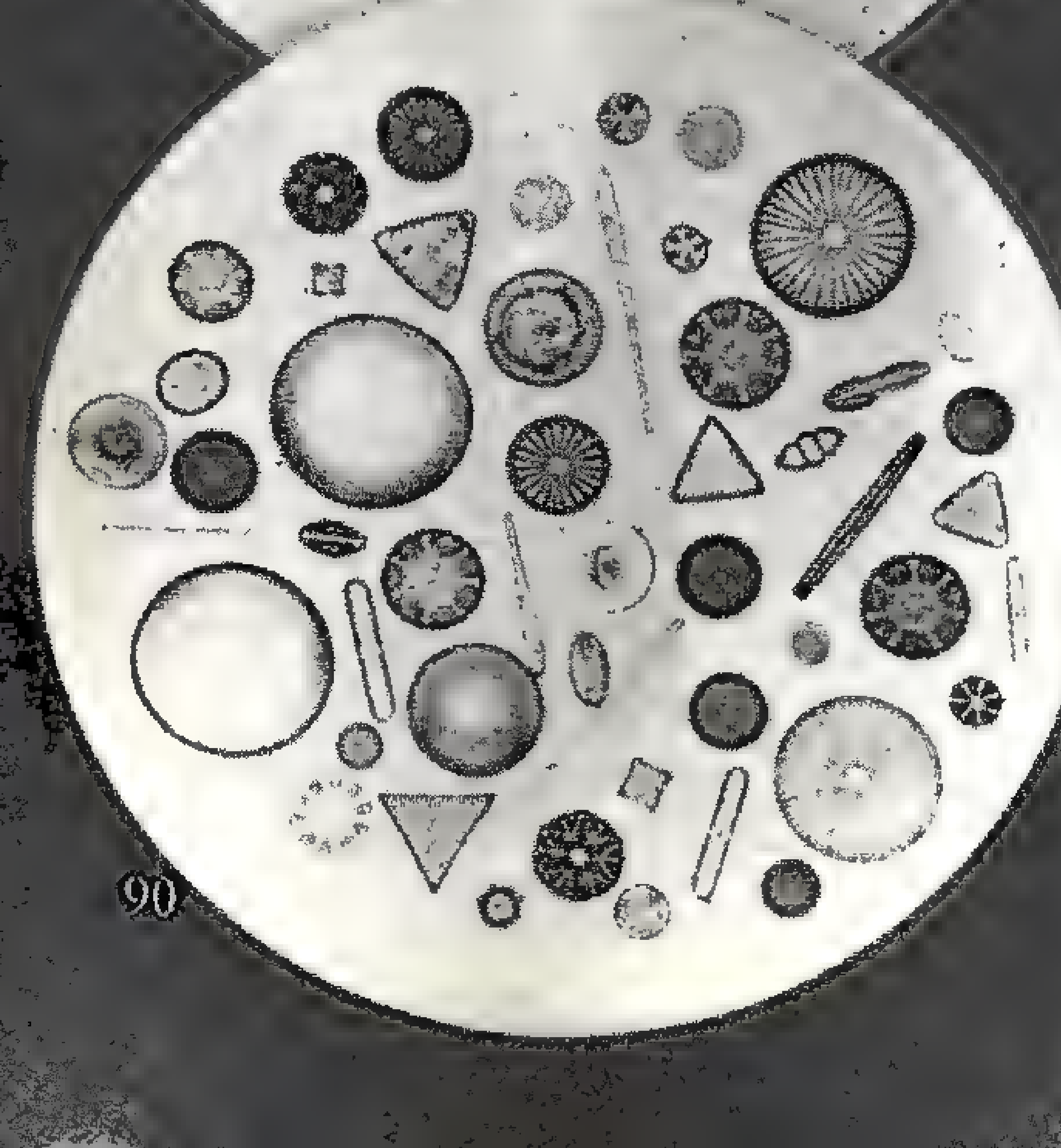
Ordinarily such minute plants would stand no chance of preservation in the rocks, but diatoms are encased in tiny glass boxes (silica) and it is these siliceous shells that remain behind after disintegration of the gelatinous protoplasm. Each shell is termed



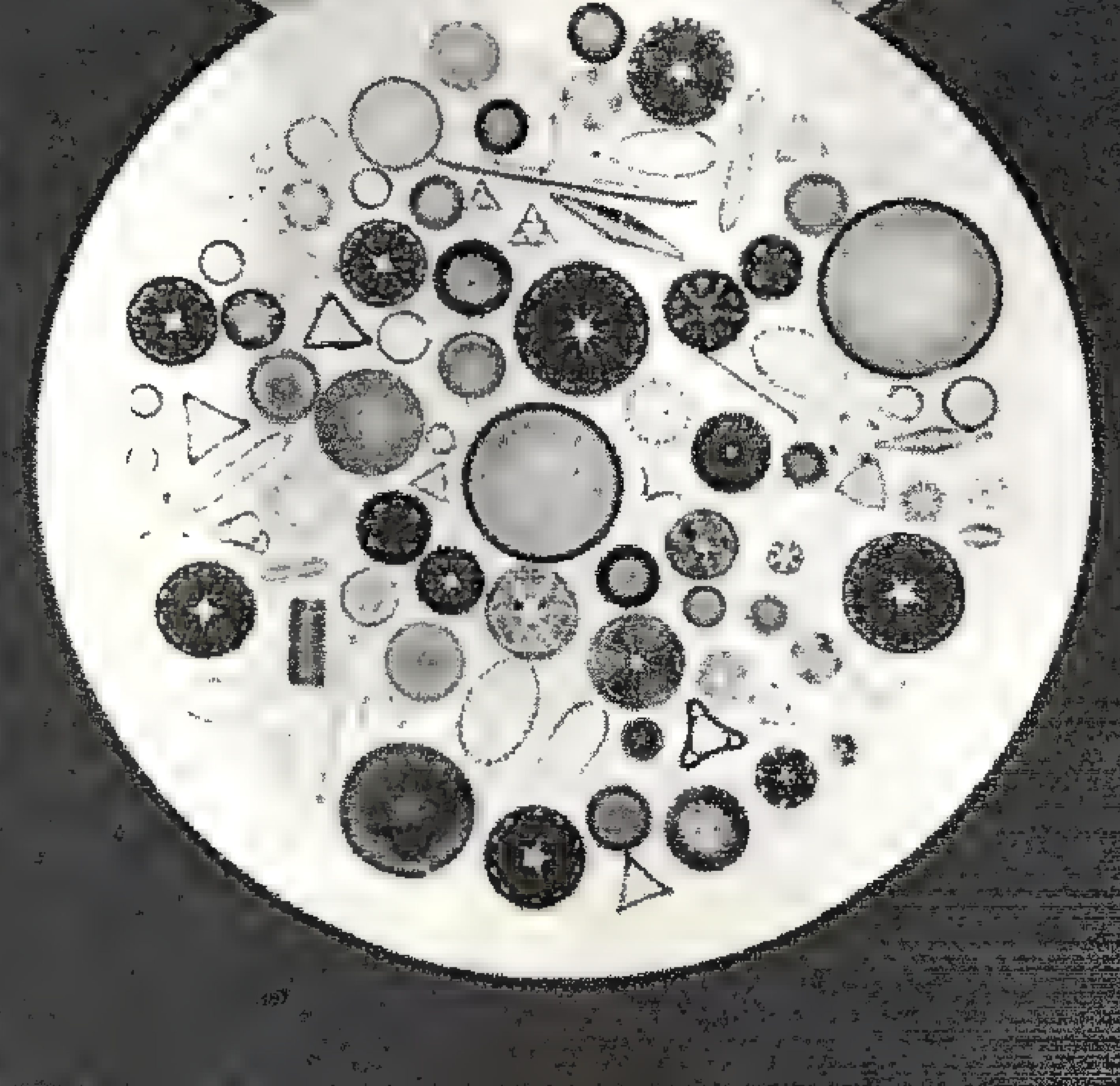
Left—A diatom exhibition slide involving 52 specimens. While simple for this type of slide, each specimen must be placed separately into accurate position.



Right—A mount for the diatom Triceratium in which the living protoplasm and its central nucleus have been retained and stained.



Left—Fifty-two diatoms arranged as a circle slide, an excellent method of showing wide variation in size and structure.



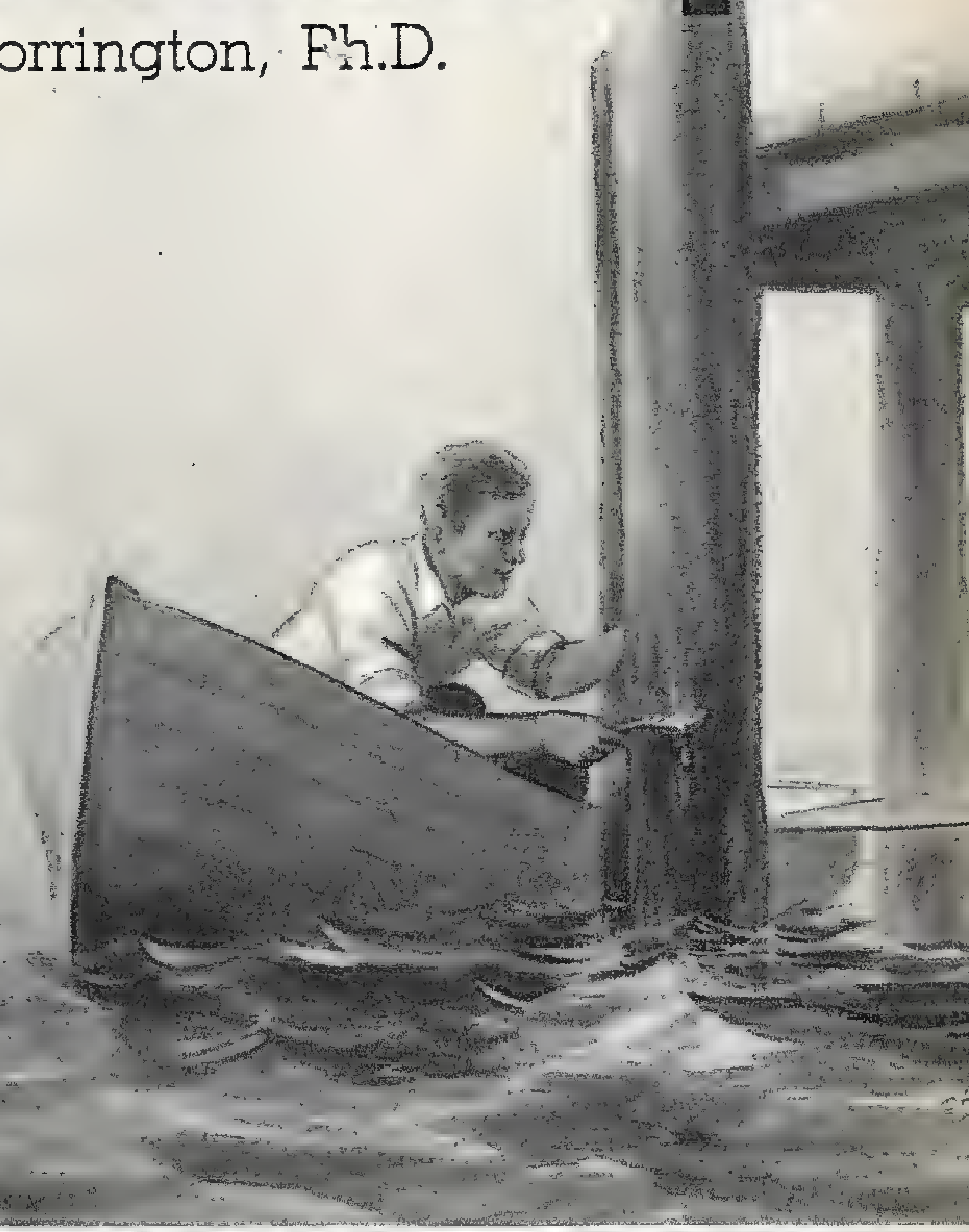
Right—Larger circle slides become more complex. This example includes one hundred specimens, mounted separately.

For Your Microscope

by Julian D. Corrington, Ph.D.

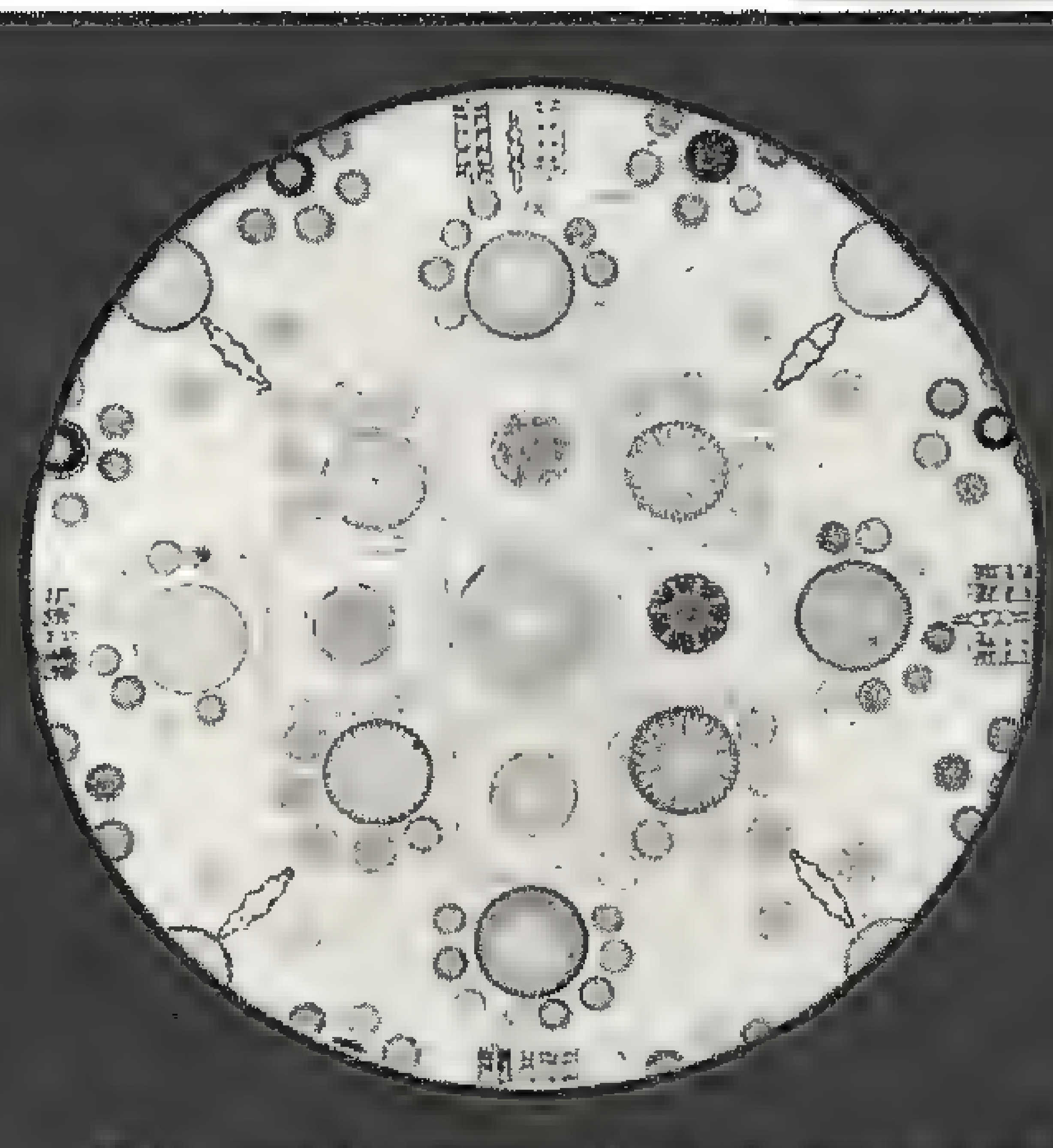
a *frustule* and is composed of two *valves* which fit together like the halves of a pill box.

On the surface of our fresh water ponds, rivers and lakes, as well as blanketing the entire ocean, is a layer of innumerable microscopic organisms, plant and animal, known as the plankton. Diatoms make up by far the largest share of this organic soup, and hence play a major role in the cycle of energy transformations involving food supplies. Like other green plants, diatoms possess chlorophyl and can manufacture starch out of simply water and carbon dioxide in the presence of sunlight; hence they bottle up the energy of sunlight and make it available to the host of creatures using diatoms as food; tiny crustaceans, hydroids, worms and fish fry. In turn these are eaten by larger animals, crayfish, frogs, turtles, the larger fish and so on to such fish-eaters as otters, seals and man. When you are dining on perch or shad you are eating material originally produced by countless diatoms!

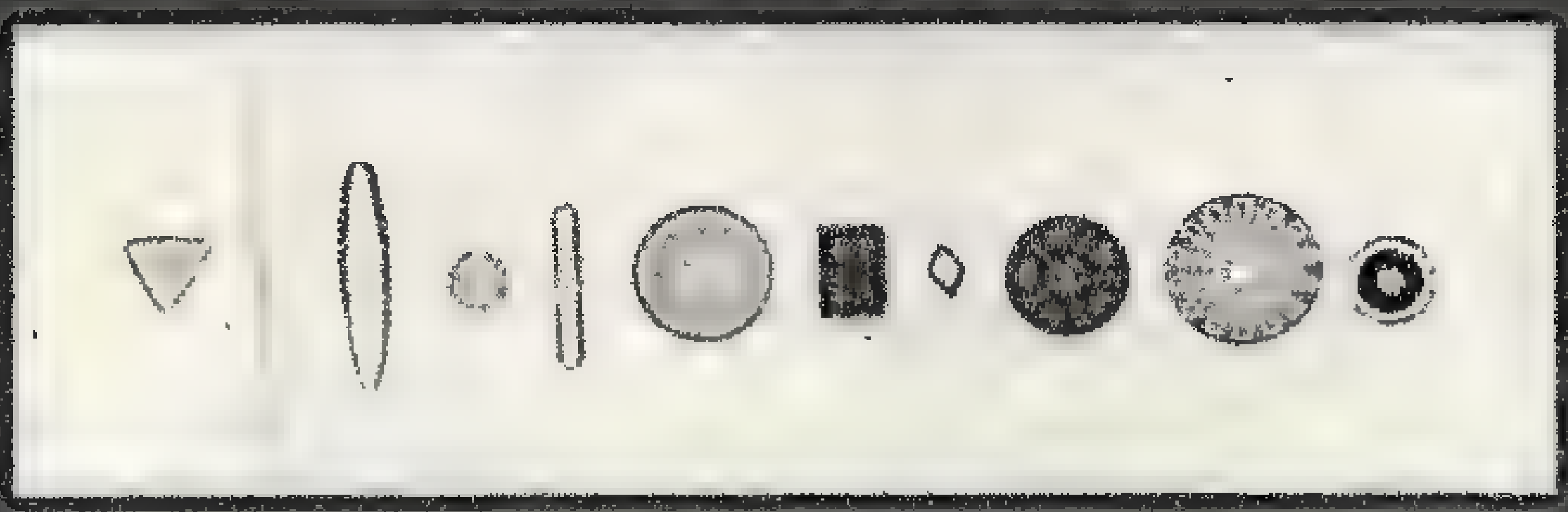


Not satisfied with the surface films of waters, diatoms occupy the bottoms as well, occurring as a fine, slimy brown sediment on muddy stream or ocean beds, and covering underwater pilings, stones,

[*Continued on page* 138]

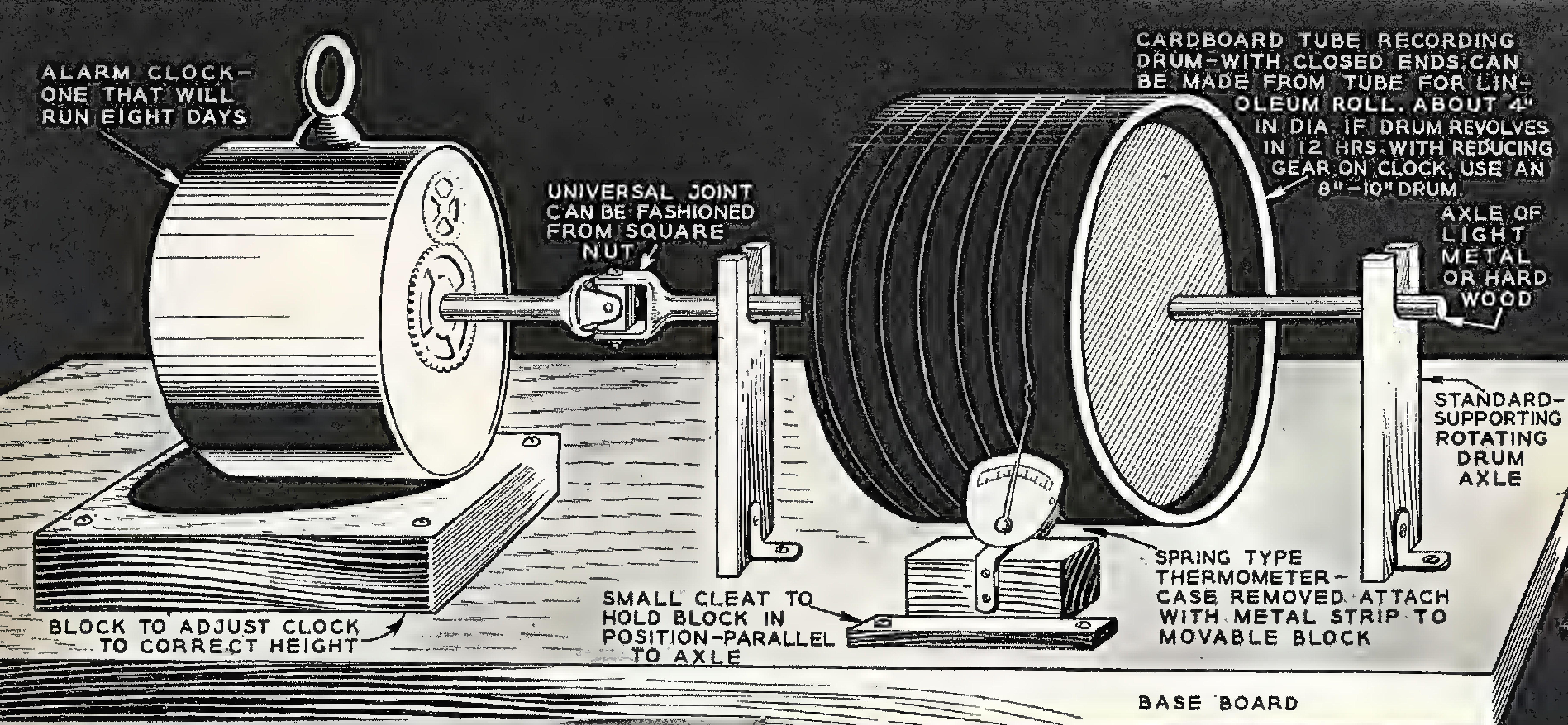


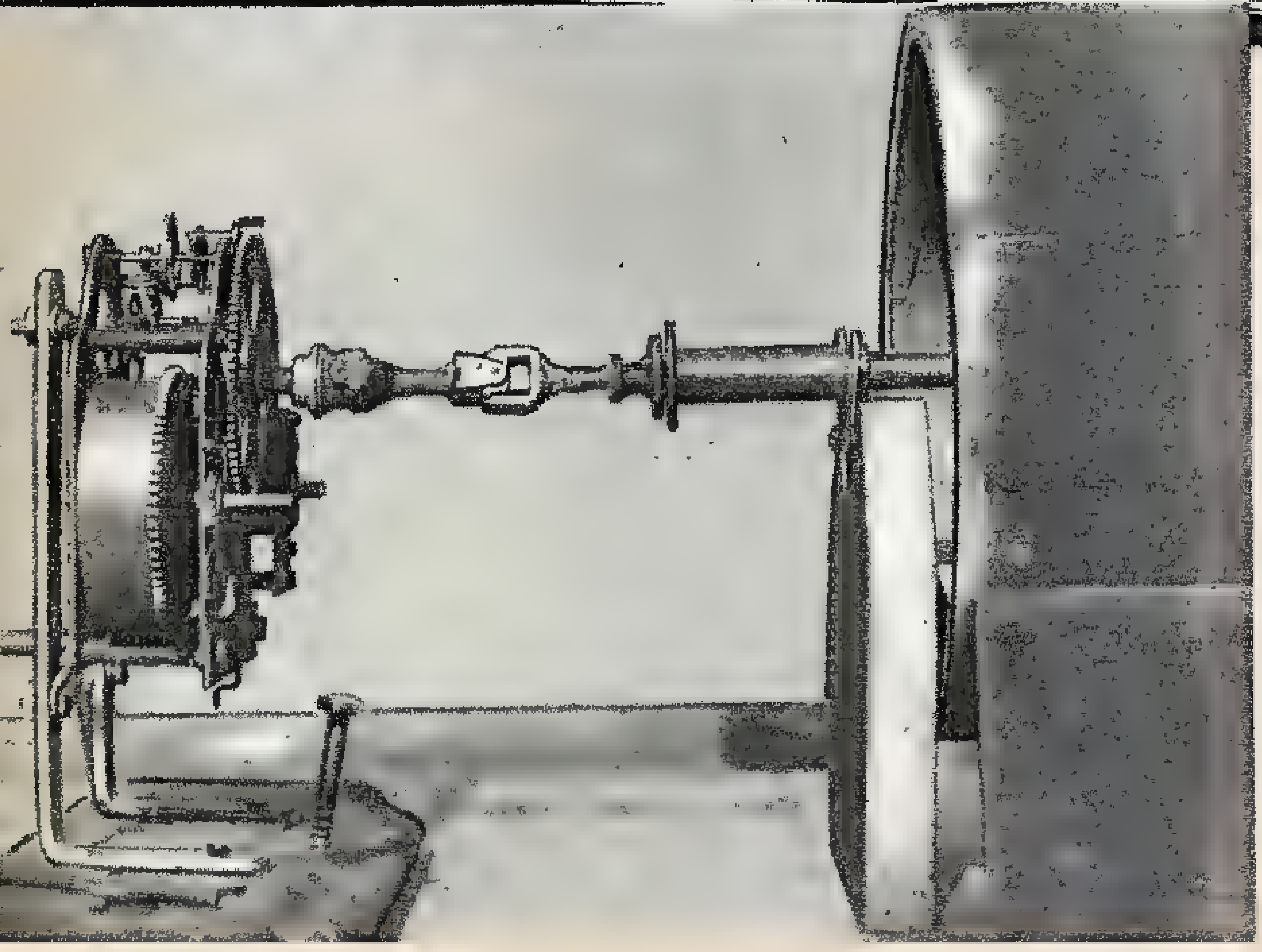
The central portion from a complicated diatom exhibition slide of 150 specimens.



The diatoms shown (left to right) are: Triceratium favus, Synedra superba, Surirella robusta, Stephanopyxis grunowii, Pinnularia cardinalis, Coscinodiscus oculus-iridis, Climacosira mirifica, Biddulphia reticulata, Aulacodiscus archangelskianum, Actinoptychus splendens, Actinocyclus ralfsii.

Mounting diatoms for an exhibition slide. Operator holds bristle in right hand, bottle of cleaned diatoms in left. Chart is followed for pattern.


ALARM CLOCK– ONE THAT WILL RUN EIGHT DAYS
UNIVERSAL JOINT CAN BE FASHIONED FROM SQUARE NUT
CARDBOARD TUBE RECORDING DRUM–WITH CLOSED ENDS. CAN BE MADE FROM TUBE FOR LINOLEUM ROLL. ABOUT 4" IN DIA. IF DRUM REVOLVES IN 12 HRS. WITH REDUCING GEAR ON CLOCK, USE AN 8"–10" DRUM.
AXLE OF LIGHT METAL OR HARD WOOD
STANDARD–SUPPORTING ROTATING DRUM AXLE
SPRING TYPE THERMOMETER– CASE REMOVED. ATTACH WITH METAL STRIP TO MOVABLE BLOCK
SMALL CLEAT TO HOLD BLOCK IN POSITION–PARALLEL TO AXLE
BLOCK TO ADJUST CLOCK TO CORRECT HEIGHT
BASE BOARD



Top—The detailed drawing shows the method of hooking up the cylinder to the clock motor. Although a universal joint is used, the builder should attempt to line up the two shafts as correctly as possible. Above—The recording cylinder hooked up to the motor with its outside case removed.

by

V. S. Gleason

HOW cold was it last night? Did the temperature in the garage drop so low the radiator was in danger?

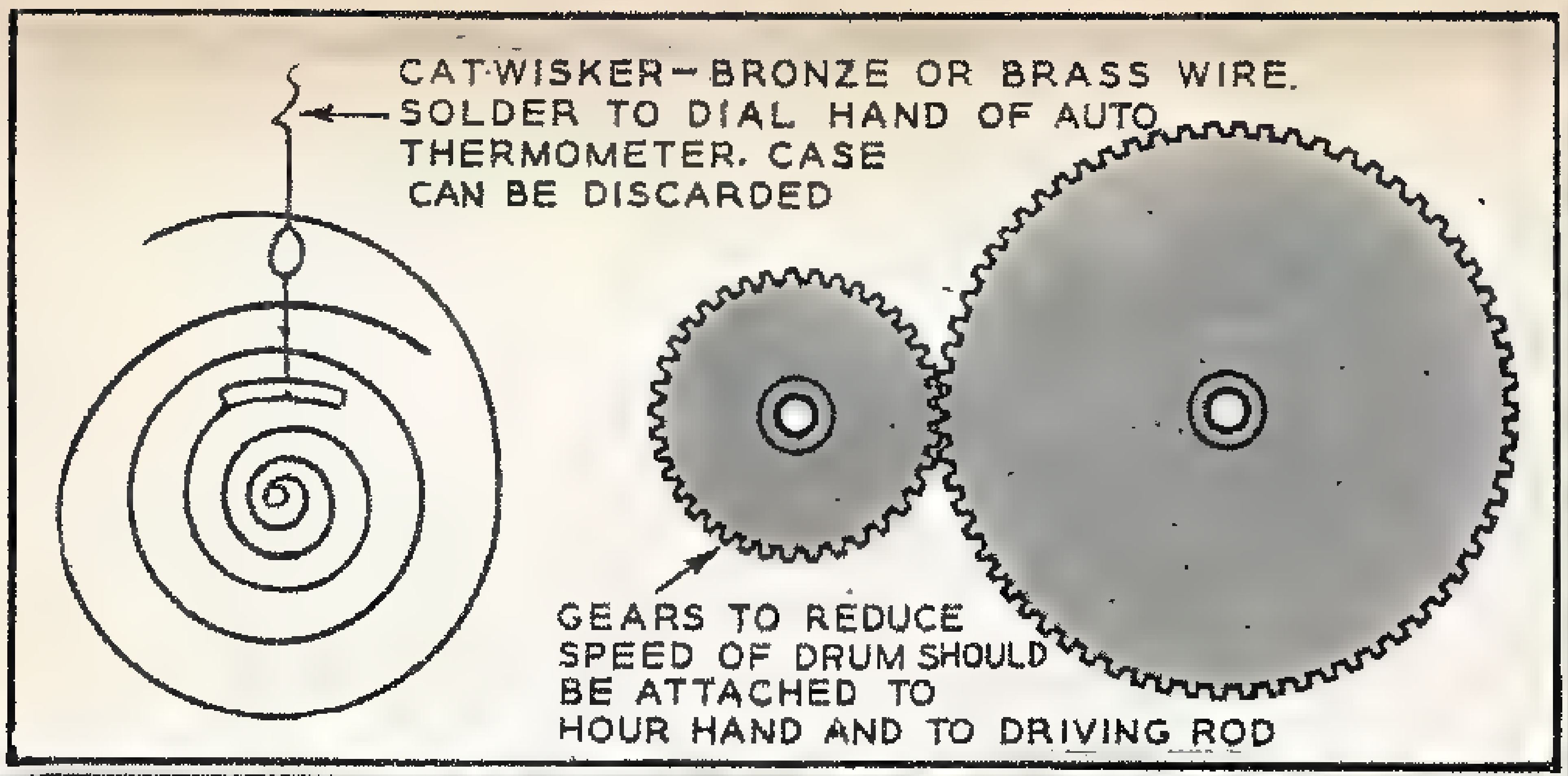
Many hobbyists, especially if they are trying their hands at weather forecasting, have felt the need for a simple temperature recorder. Here is one that may be made easily and inexpensively, using a spring-type thermometer of the kind sold for a few cents at automobile accessory stores.

Remove the case and solder a piece of bronze or copper wire to the end of the indicating hand. This additional length will magnify the arm movement. Then attach the instrument to a block of wood by a metal strap. The recording drum may be made of cardboard tubing such as linoleum is wound upon. Usually this may be had for the asking at a furniture or hardware store. Mounted upon a light metal axle between two upright supports attached to the 2"x12" plank used as a base, it should revolve freely on its bearings. The driving mechanism is made from an old alarm clock, attached so that the hour hand is in line with the drum shaft. Connection is made through a universal joint to prevent friction due to misalignment.

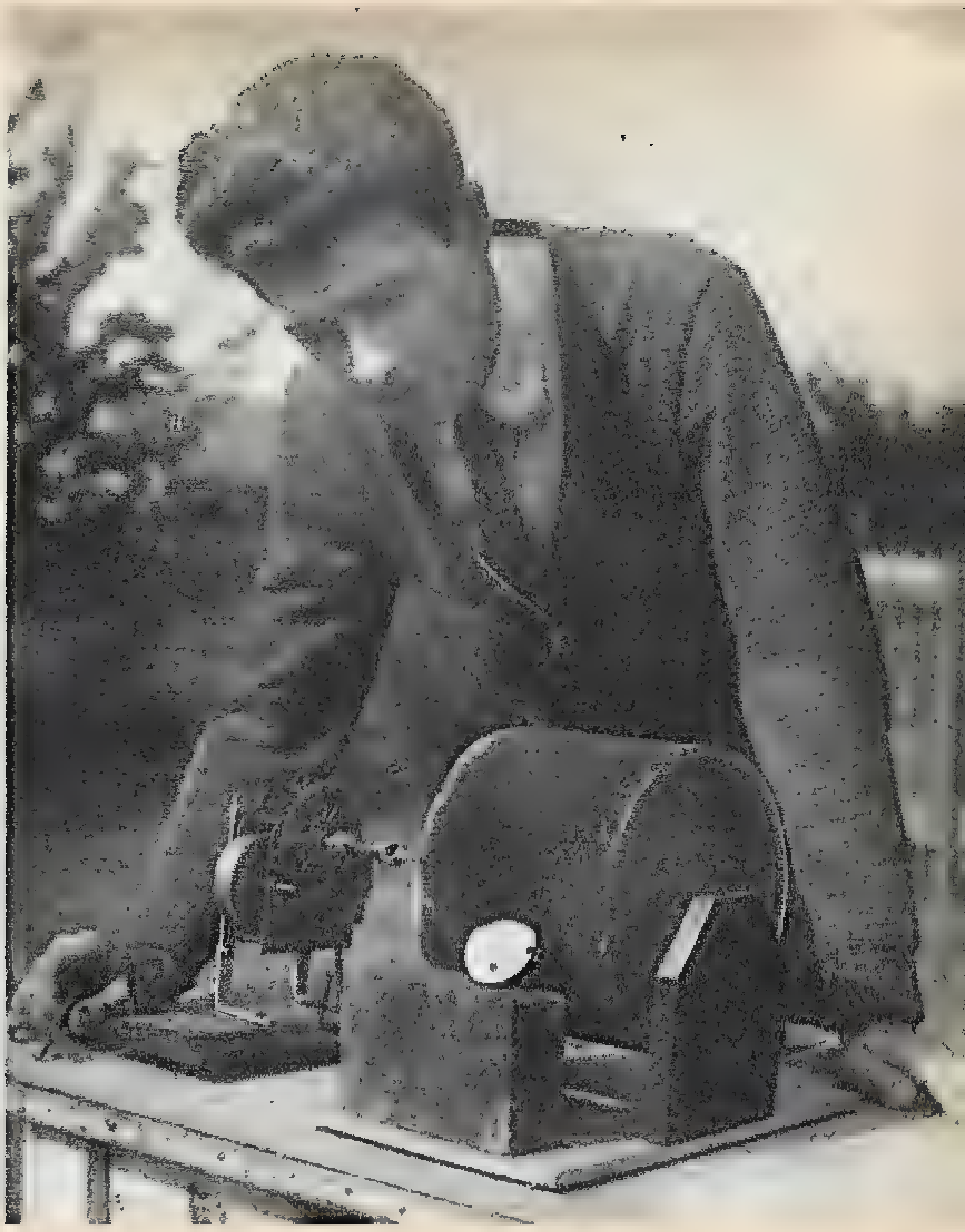
Place the thermometer in such a position that the end of the catwhisker touches lightly upon the surface of the recording drum, and screw it fast. The recording sheet is prepared from ordinary letter paper by holding it over an oil lamp, minus chimney, until well blackened. After the record is made, it is preserved by dipping it in a solution of one part shellac to three parts alcohol, and hanging it up to dry. Thereafter it may be handled without danger of smudging.

Because the hour hand of the clock makes one complete revolution every twelve hours, the block to which the thermometer is attached must be slipped over to prevent overrunning the tracing on the drum. A small cleat as shown in the diagram serves as a guide to save time when making this change. An improved method is to introduce a reducing gear so as to turn this drum over only once in 24 hours.

To calibrate the instrument, set the thermometer hand at various points on the dial—say, ten degrees apart—and turn the drum to produce a series of scratches corresponding to the desired readings. These spacings may then be laid out on the edge of a card to form


CATWISKER—BRONZE OR BRASS WIRE. SOLDER TO DIAL HAND OF AUTO THERMOMETER. CASE CAN BE DISCARDED
GEARS TO REDUCE SPEED OF DRUM SHOULD BE ATTACHED TO HOUR HAND AND TO DRIVING ROD

INEXPENSIVE THERMOGRAPH MADE FROM AUTO THERMOMETER



Above — The recording thermometer in operation. The lines scratched on the cylinder are visible on the right side.

Left — Attaching the small bronze or brass wire to the end of the dial pointer of the automobile thermometer. In use, a case on the thermometer is not necessary.

Right—Washing the completed record of the thermograph in a solution of alcohol and shellac to give it permanent protection against damage.

a ruler-like instrument, with its graduations in degrees instead of fractions of an inch. Or, a series of parallel lines spaced by the proper amounts may be laid over the record for quick reading.

It is advisable each time you start the recorder to scratch the initial temperature reading upon the record itself so as to prevent errors in interpretation.

When setting up the equipment for use, it should be placed in a reasonably protected spot so that wind will not affect the reading on the thermometer. If it is to be used outside for long periods of time, it should be covered with a hood which could consist of a wooden box, to protect the instruments against dust and rain. Be sure to leave plenty of openings in the box to permit sudden temperature changes to be transmitted to the instrument quickly without a noticeable time lag.

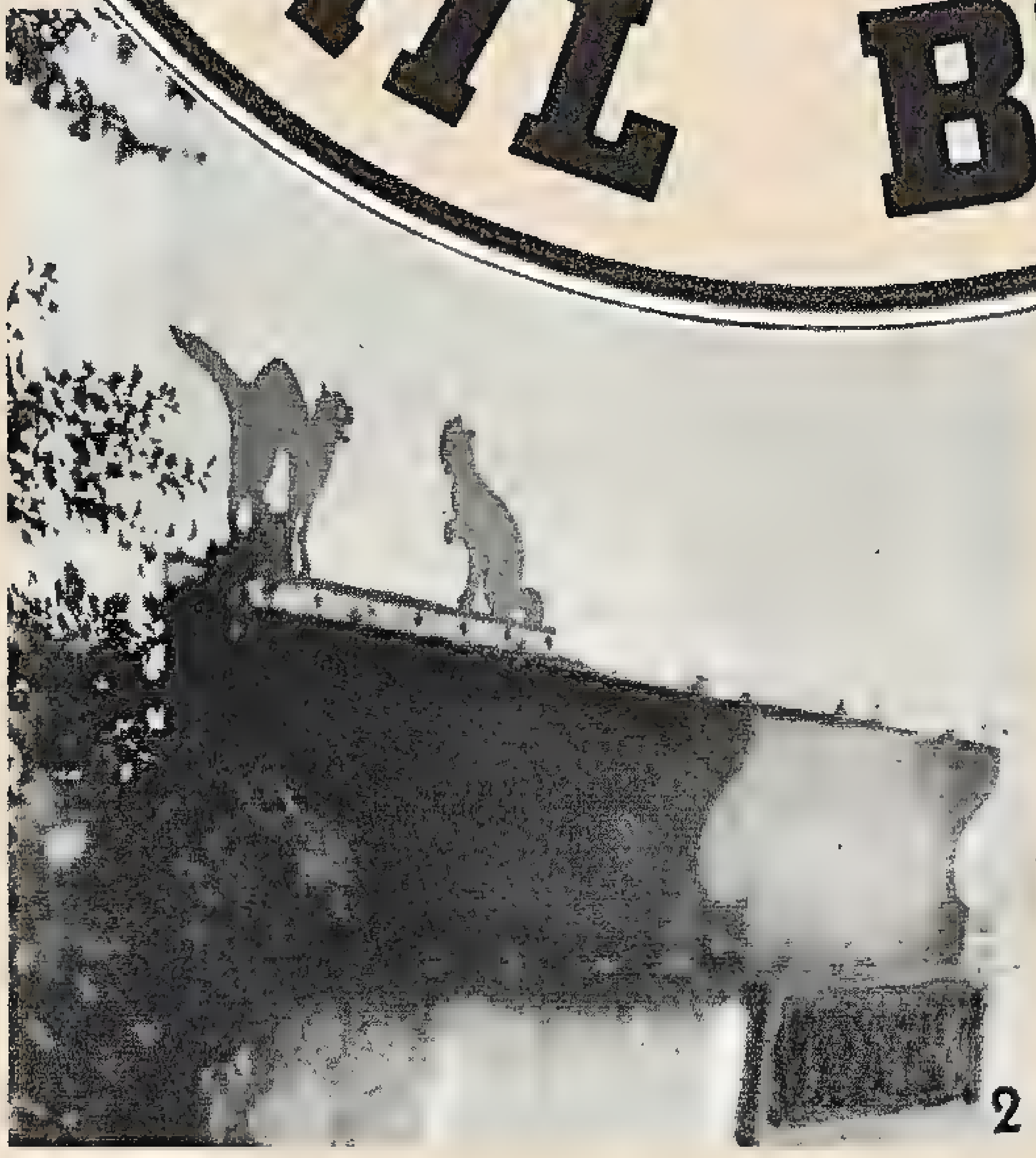
Three "OO" Gauge Model RR Cars is the title of a how-to-build article in the November issue of MECHANIX ILLUSTRATED which will have more than ordinary appeal to model fans. Each car is a gem, and the building directions are so simple that any modeler will have no trouble duplicating them. Don't miss the November issue.

DECORATIVE MAIL BOXES

1

by

Dale R. Van Horn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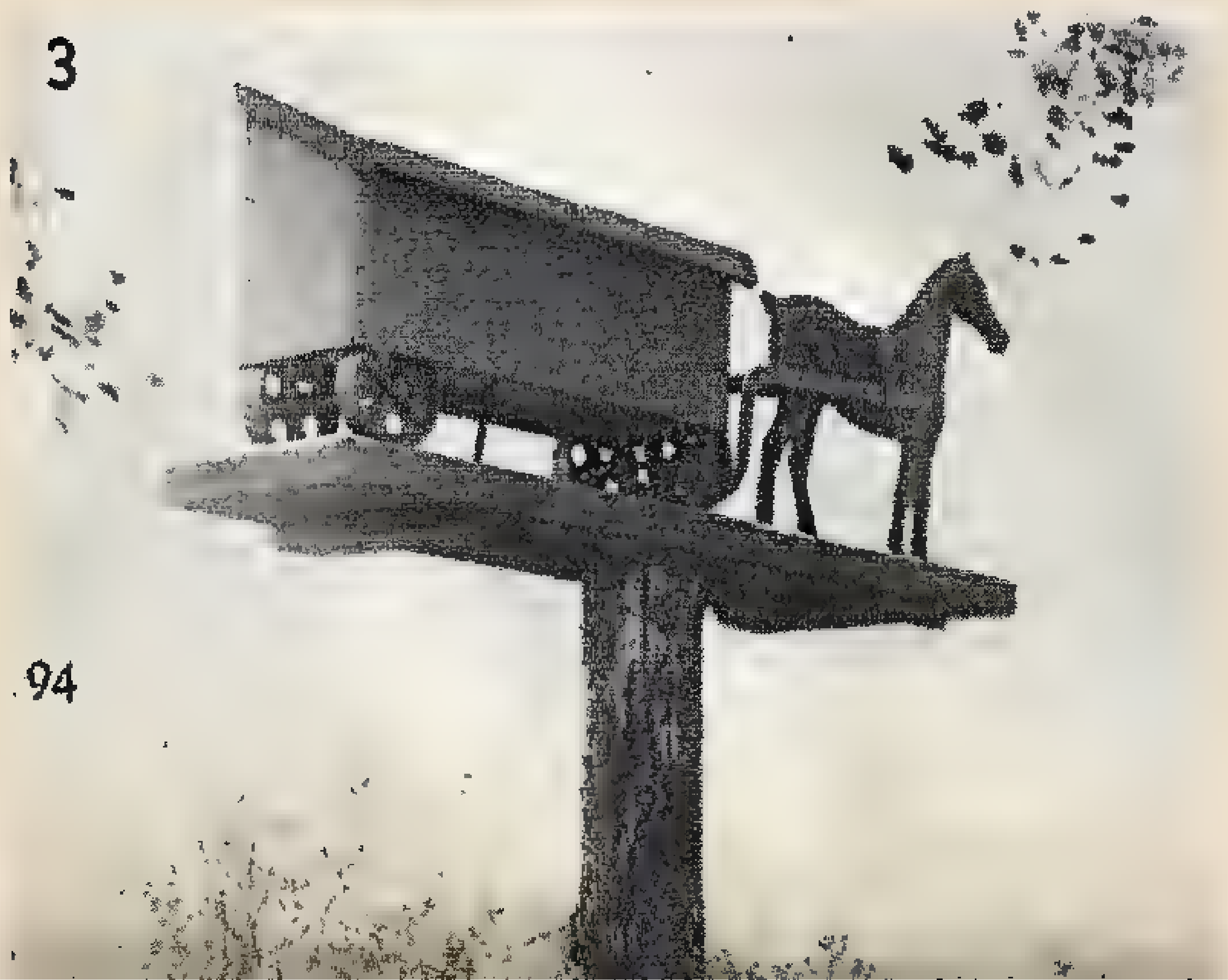

3

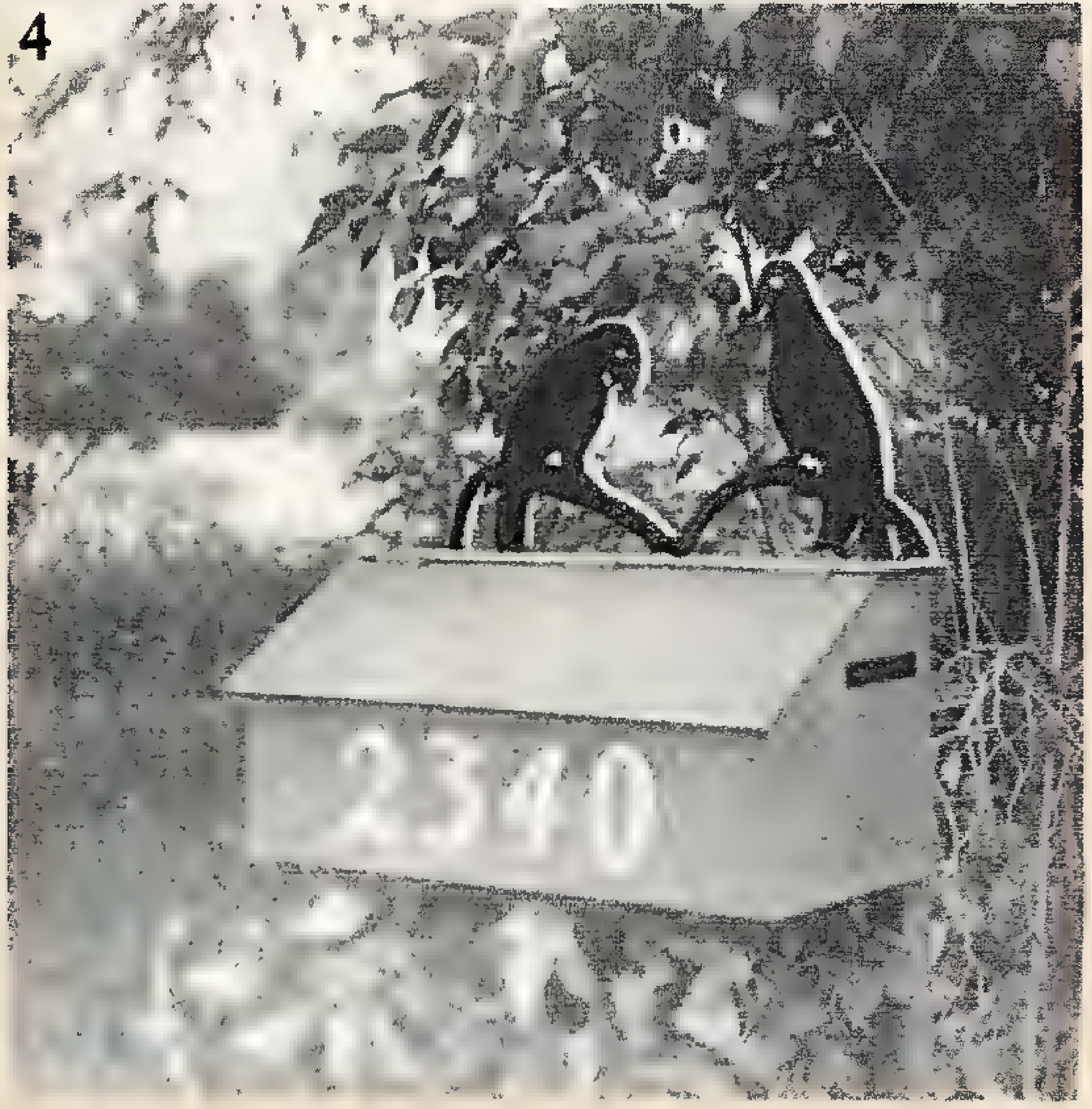
A RECENT drive through a mid-western city's most exclusive residential district disclosed but one appropriate mail box. All others were the large galvanized iron affairs commonly used in mail order districts.

"How odd," someone exclaimed, "that more of these expensive homes aren't provided with attractive mail receptacles. These good folks spend $25,000 or $50,000 for a home, landscape it well, then put a $1.98 mail box on a 30-cent fence post right out front."

Although a mail box first of all should be weather proof and lasting, it would seem that a little more attention to its appearance would be worthwhile.

As for the cost, look at the mail box in Figure 2. This is of solid brass and bolted together. There are two angry cats in the cutout at the back which required some work with jig saw and file.

In Figure 4 is shown a sheet iron box, hand made and spacious, mounted on two angle iron posts which are embedded in the ground. The chief element of novelty about this box is the parrots which adorn the back. They


4

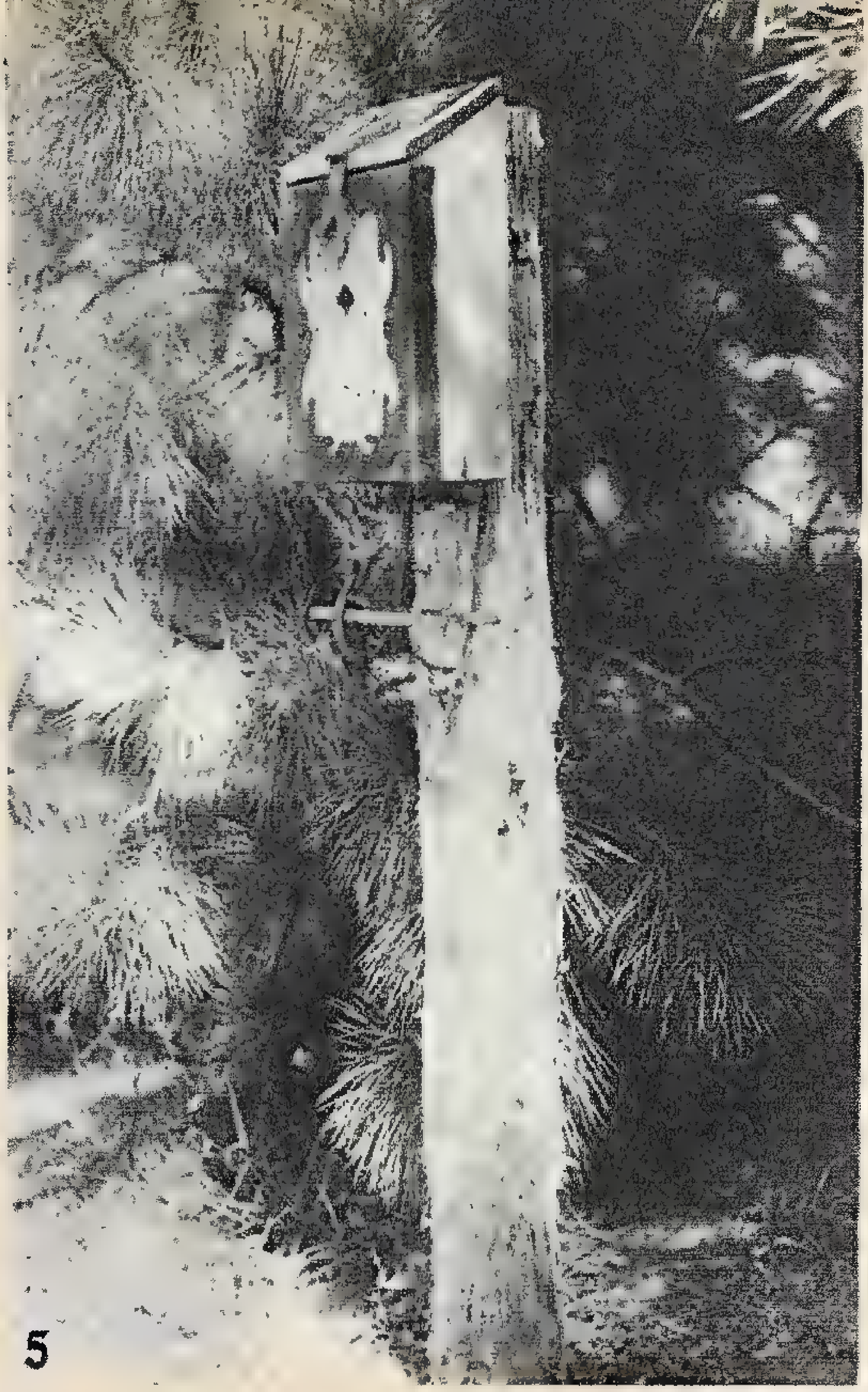
are also cut out of the sheet metal. Appropriately enough, the owner's name is Polly, so a pair of pollys becomes the mail box motif. Ideas like this are always appropriate for mail box designs when and if they can be worked in harmoniously.

A neat little job, easy to make and durable, is the mail box shown in figure 5. Here is a stout box of oak and trimmed in sheet iron. The front plate has been cut out in a decorative design, then fastened to the front of the box with screws.

The mail box shown in figure 3 is an ideal story-telling mail box, yet entirely homemade. To begin with, the box is the side opening, galvanized iron kind still quite common. The iron wheels, picked up at an auction or the junk yard, were securely fastened to the bottom. The horse is a sheet iron cutout and the harness and shafts are light strap iron.

Another metal cutout design of good proportions is the silhouette back of the metal mail box shown in figure 6. The sides of the box are of sheet iron, riveted and welded together and is mounted on a pair of iron posts 1½ inches square.

Another metal box of plain lines but topped with a decorative unit of blackbirds and cat tails in iron is shown in figure 1. Note the simple support—just an angle iron riveted to the rear of the box. The corner angle irons which are riveted to the sides and ends of the box to hold these flat pieces together are continued to points and bent slightly outward, furthering the artistic appearance of the box.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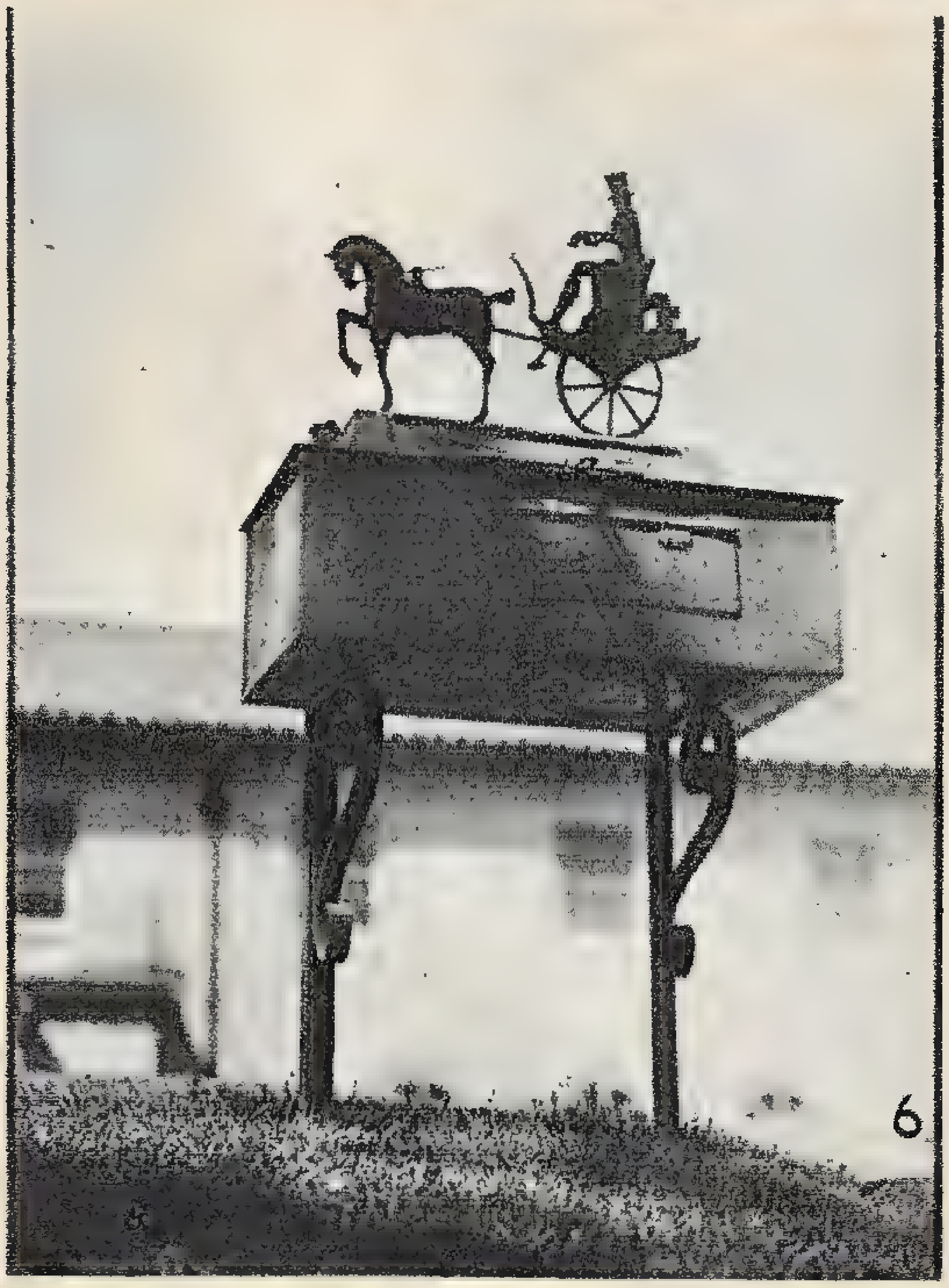

6

Those who are tired of the conventional type mail box can, with a little effort and planning, use their own ideas to good advantage in the construction of a mail box having a motif in keeping with individual conditions. When completed the project will be a continual source of pride to the owner, as well as being a most useful ornament for the old or new house.

Hints

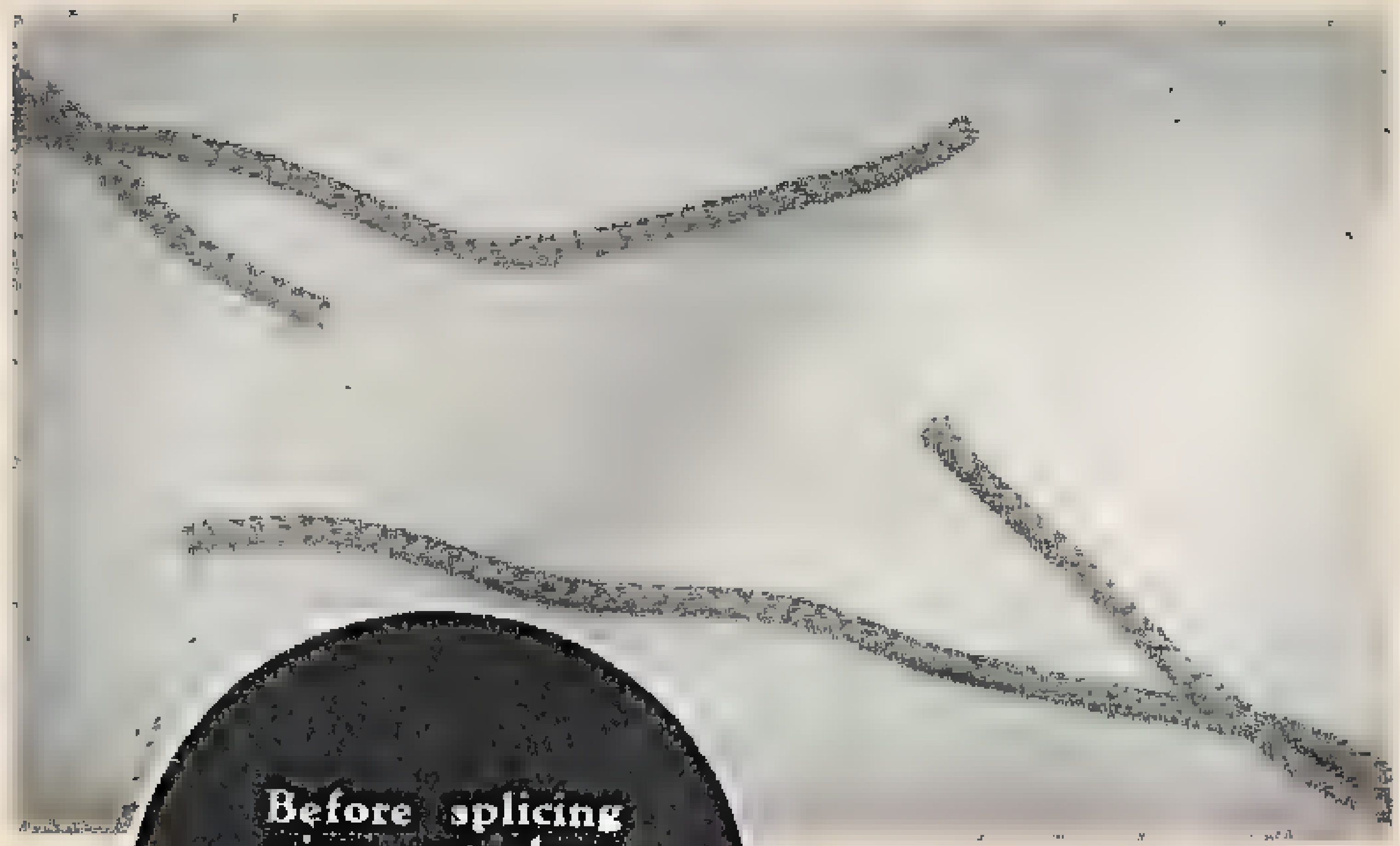
A few inexpensive tools make many home electrical repair problems easy for either husband or wife.

by
Harry Hirsch

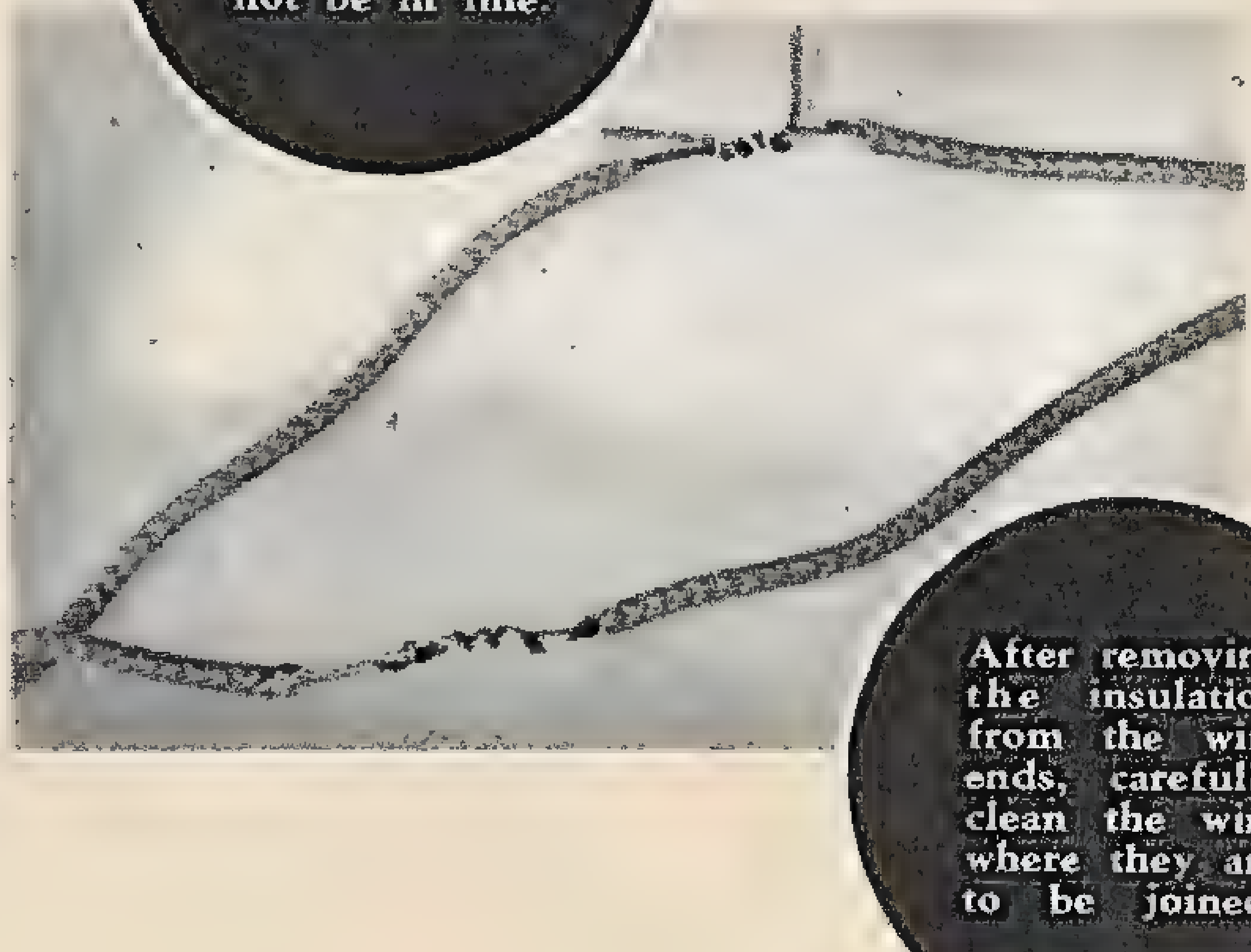
THE ordinary electrical repairs that must be made around the house from time to time usually are of very simple nature. The required tools themselves are simple and if they are not already available they can be purchased inexpensively at the neighborhood hardware store. A representative assortment that even the lady of the house can learn to use competently with a little instruction is as follows: a small electric soldering iron, ordinary pen knife (the "boy scout" variety will stand a lot of abuse and is therefore recommended), six-inch "electrician's" side cutting pliers, a small screwdriver, a roll of rosin core solder, and a roll of black friction tape.

Probably the most common electrical job the handy man is called on to do is extending the cord of a floor lamp, a radio receiver, a fan, etc. The first step is to cut the ends of the old and the new cords unevenly, as shown in the pictures, using the side-cutting pliers. Hold the end of the wire and carefully pare off about two inches of the cotton and rubber covering with the knife. At first you will probably nick off a few strands of the wire, but after a little practice the insulation can be removed with two or three short strokes. Scrape the wire bright and clean with the back edge of the knife, twist up the loose strands, and scrape it again.

Twist together the staggered ends of wire, using tight but somewhat open twists. Plug in the electric soldering iron, and while it is heating scrub its points with a coarse piece of emery cloth. After about five minutes hold end of wire solder to the points, and the latter will instantly become coated with a bright



Before splicing wires cut them to unequal lengths so that the joints will not be in line.



After removing the insulation from the wire ends, carefully clean the wire where they are to be joined.

FOR THE HOME ELECTRICIAN

layer. This operation is known as "tinning." Now hold the hot iron and the solder against the twisted wire joint, let the molten solder run all around it, and remove the iron after about ten seconds. Let the joint cool and it will be fastened securely. Soldering is a very simple process and is always easy if the wire is clean and the iron is well tinned.

To complete the job, tear off about five inches of friction tape and wrap it tightly around the joint, overlapping the insulation at each end. Incidentally, ordinary white adhesive tape (the kind you buy in the drugstore) is also very good for this purpose, especially if the joint will show up in the living room or some other place where black might be objectionable.

To connect the loose end of the new wire to the attachment plug, pull the wire through the center hole first, pare off not more than ½" of the insulation and make sure no loose ends stick out. Pull the wire down carefully and bind the ends under the connecting screws. Short circuits frequently occur in these plugs because loose strands of the fine wire stick out and touch each other. If you want to do a really nice job, cut some short, narrow pieces of friction tape and bind it around the frayed insulation at the ends of the wires.

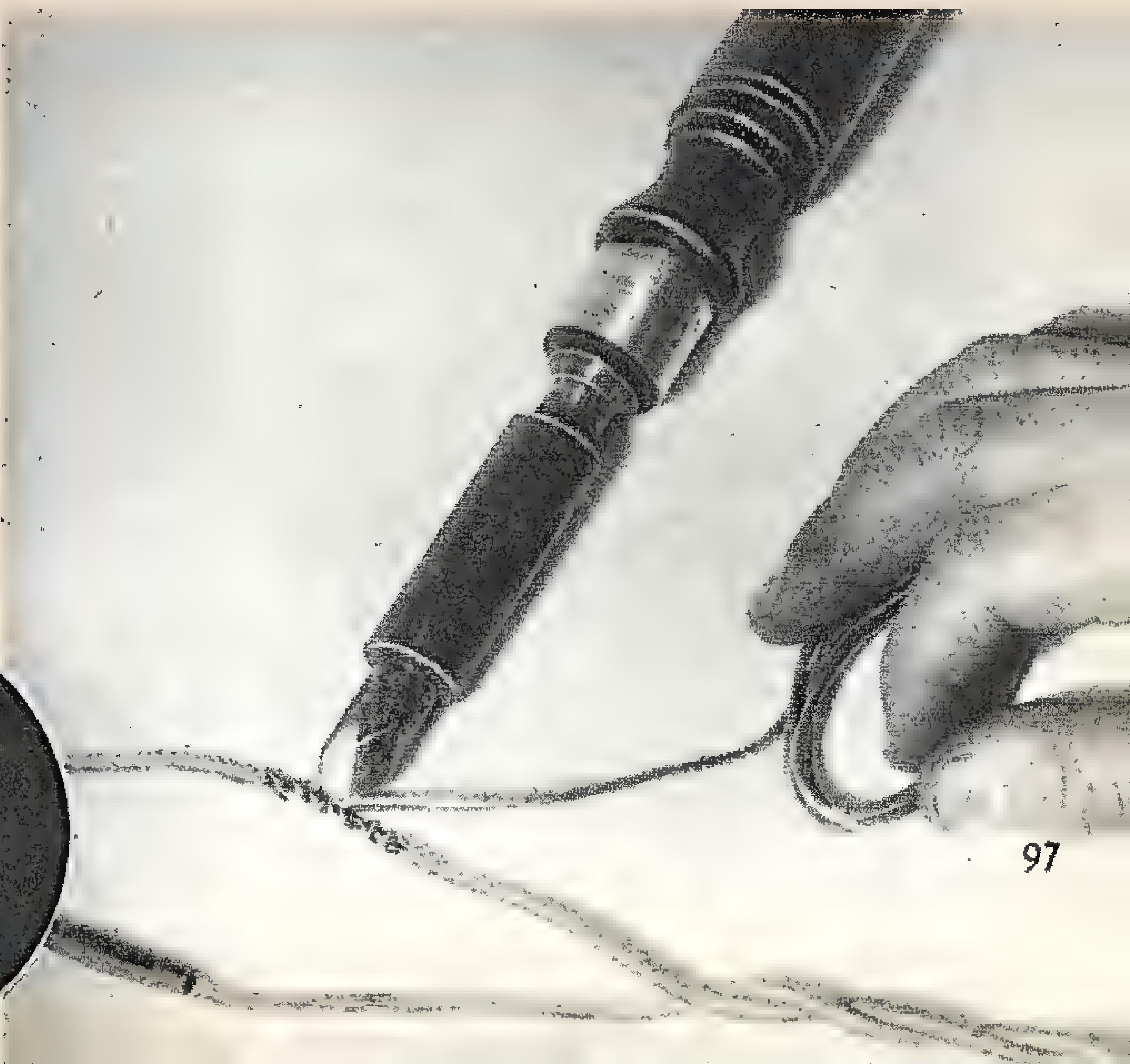
The plug shown is a common type. There are better styles with short handles on them to facilitate removal from tight receptacles.

"Exactly what is a 'short circuit'?" many people ask. A "short" is an accidental connection that causes a sudden and heavy rush of current in excess of the safe carrying capacity of the electric wiring, and usually causes the protective fuses to burn out. If there were no fuses in the circuit, the wiring itself would become white hot, and might readily start a fire. Two worn wires from a floor lamp, for instance, might eventually lose their outer covering because they have been stepped on. When they touch each other there is a flash of flame, and an instant later the fuses blow, causing all the other lights on the circuit to go out.

Sometimes the house fuses blow out with all electrical devices in good working order. This usually is caused by an accumulation of normal "loads," all coming on at once. For instance, a refrigerator, an oil burner, a toaster and a heating pad may by chance all snap on at about the same time. The starting currents of these machines and instruments are rather high, and the correct normal size of fuse may blow. Unless the blowing becomes regular, do not install a larger fuse; it is safer to retain the normal size and to put in replacements.

Incidentally, not many persons know about several little conveniences in the fuse field. The first is a fused three-way outlet. This contains two automobile type cartridge fuses inside the molded form; they are quickly removed with a nail or other thin object. If there is a short circuit or temporary overload on the appliances connected to that outlet, only the fuses contained in it blow out, and the rest of the circuit is not affected. This is a great convenience, especially if the house fuses are in some dark spot in the cellar or up against the ceiling in a closet in an apartment. Equipping every regular outlet in the house with one of these outlets (cost only about a quarter) is an excellent investment.

The same idea is carried out in a fused



A well tinned soldering iron will be found to be a great convenience for making a satisfactory joint.

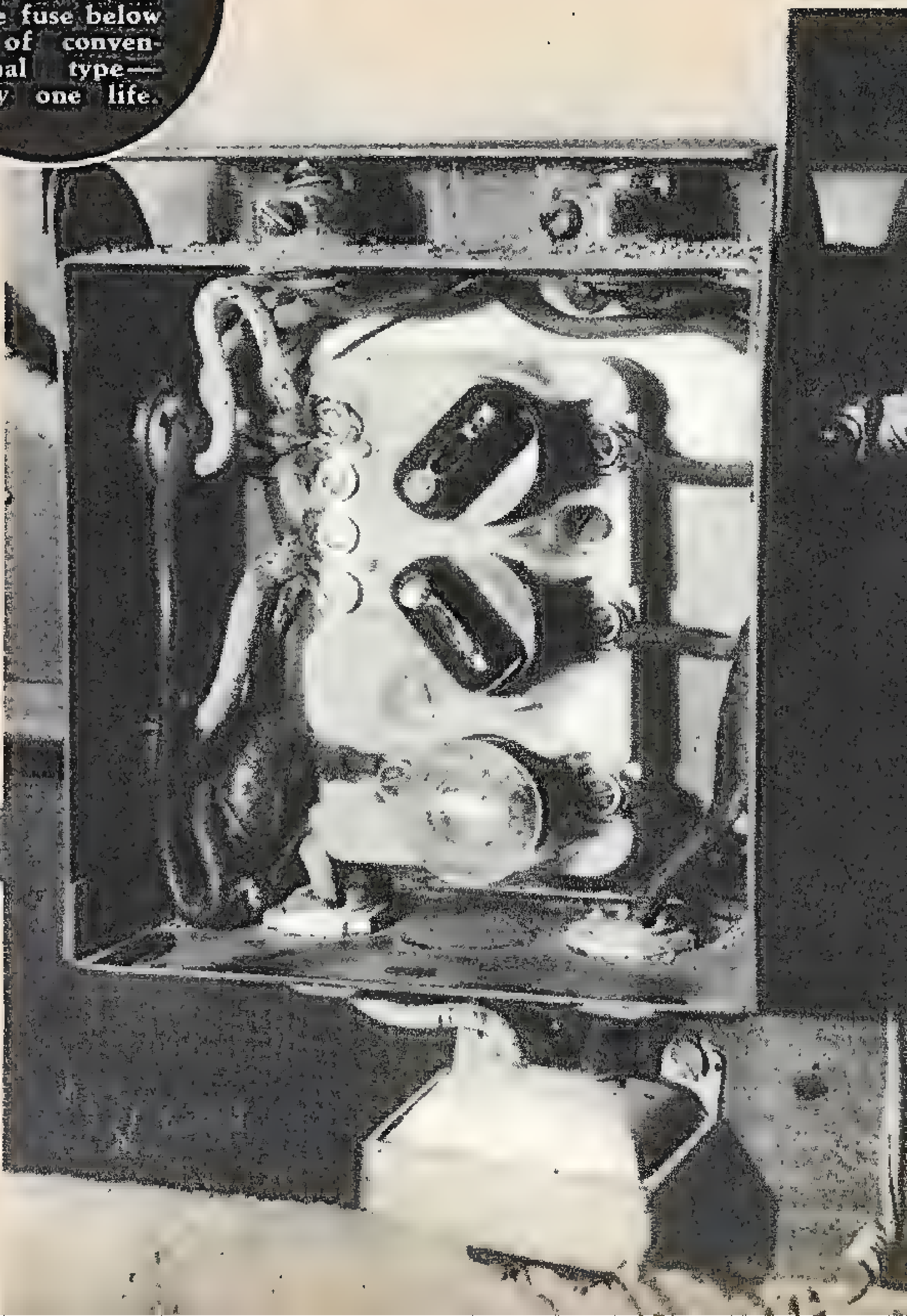
attachment plug. This is only a little heavier than an ordinary plug, and also contains two fuses.

A third device worthy of attention is a five-way fuse plug that lights up red when it has blown one of its sections. This saves no end of groping around in the dark. Once you reach the fuse box you simply reach for the red glow (which comes from a tiny neon tube) and turn the knob to the right. Another fuse element comes into position and the circuit is restored, provided the short circuit was only temporary. If the short continues, the fuse will blow again, and the trouble should be located before all five parts of the fuse are used up.

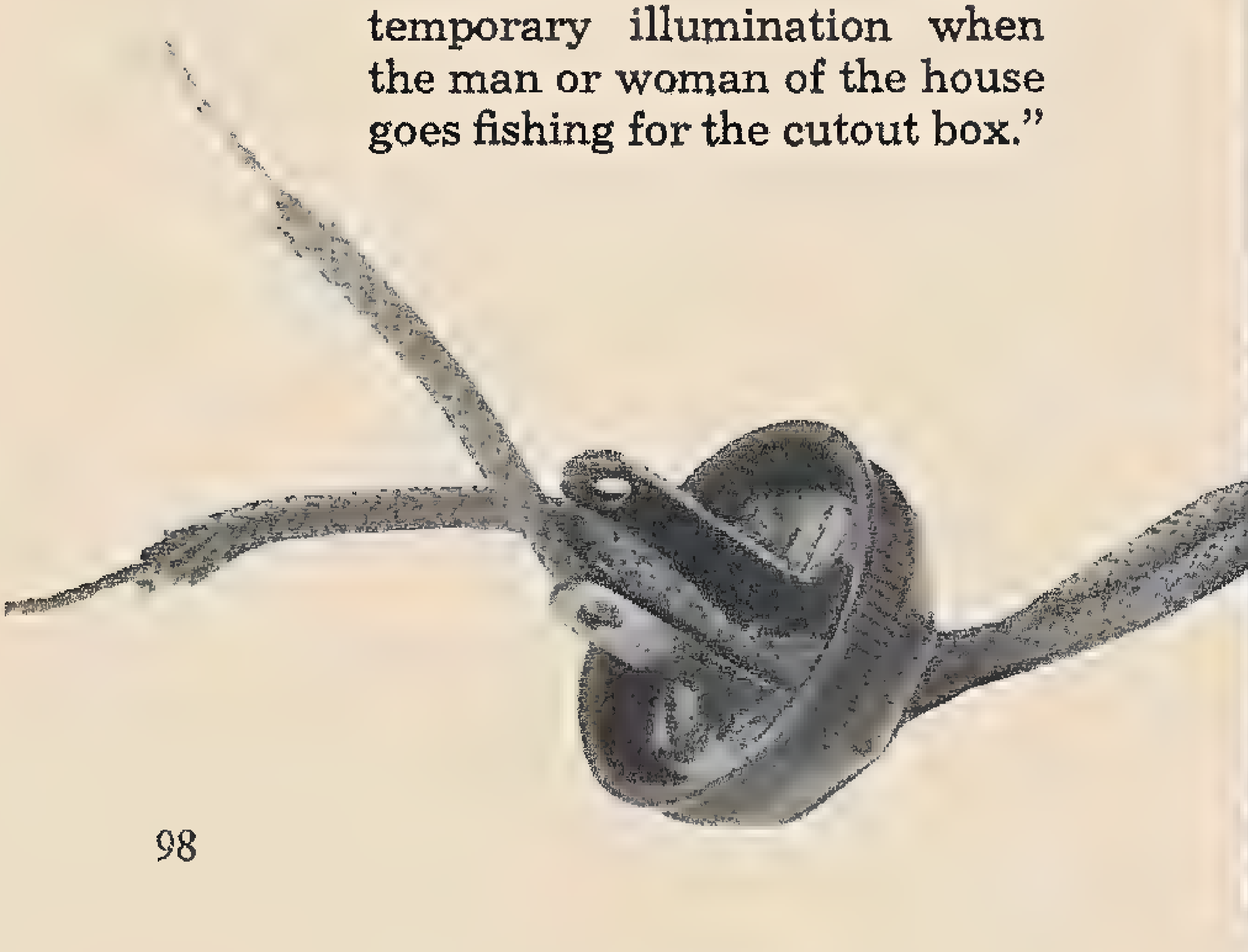
Lamps, vacuum cleaners, toasters, and other semi-portable appliances, develop most of the electrical troubles in the home. A particular point to watch is the place where the cord enters the case. The insulation wears very quickly here, and should be reinforced with tape. If your family has the habit of removing plugs by pulling on the cords, look at the connecting screws once in a while and tighten them up. Wire that is coiled up and knotted often develops breaks inside the insulation, and this causes very annoying intermittent operation that is not easy to explain until the wire is tested. After finding the break, cut the wire open and make a good soldered joints of the ends.

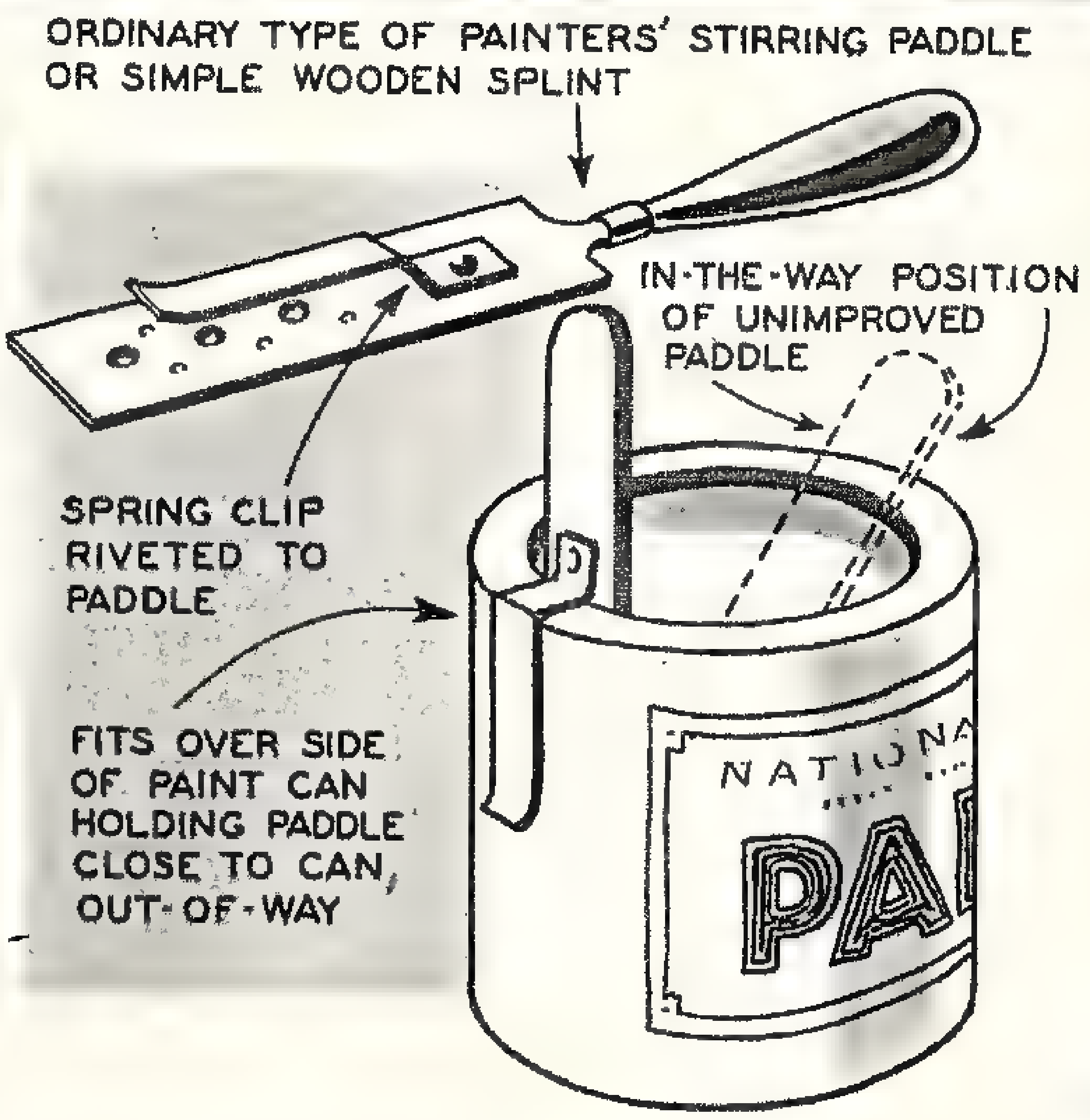
One of the best pieces of advice given by experienced trouble-shooters for the utilities companies is: "Keep a flashlight somewhere around the house where you can find it easily. Most electrical short circuits in the house do nothing more than blow the fuses; the real damage usually results from matches, candles and cigarette lighters used for temporary illumination when the man or woman of the house goes fishing for the cutout box."

Outlet plugs having self-contained fuses prevent main line fuses from blowing and plunging house into darkness.



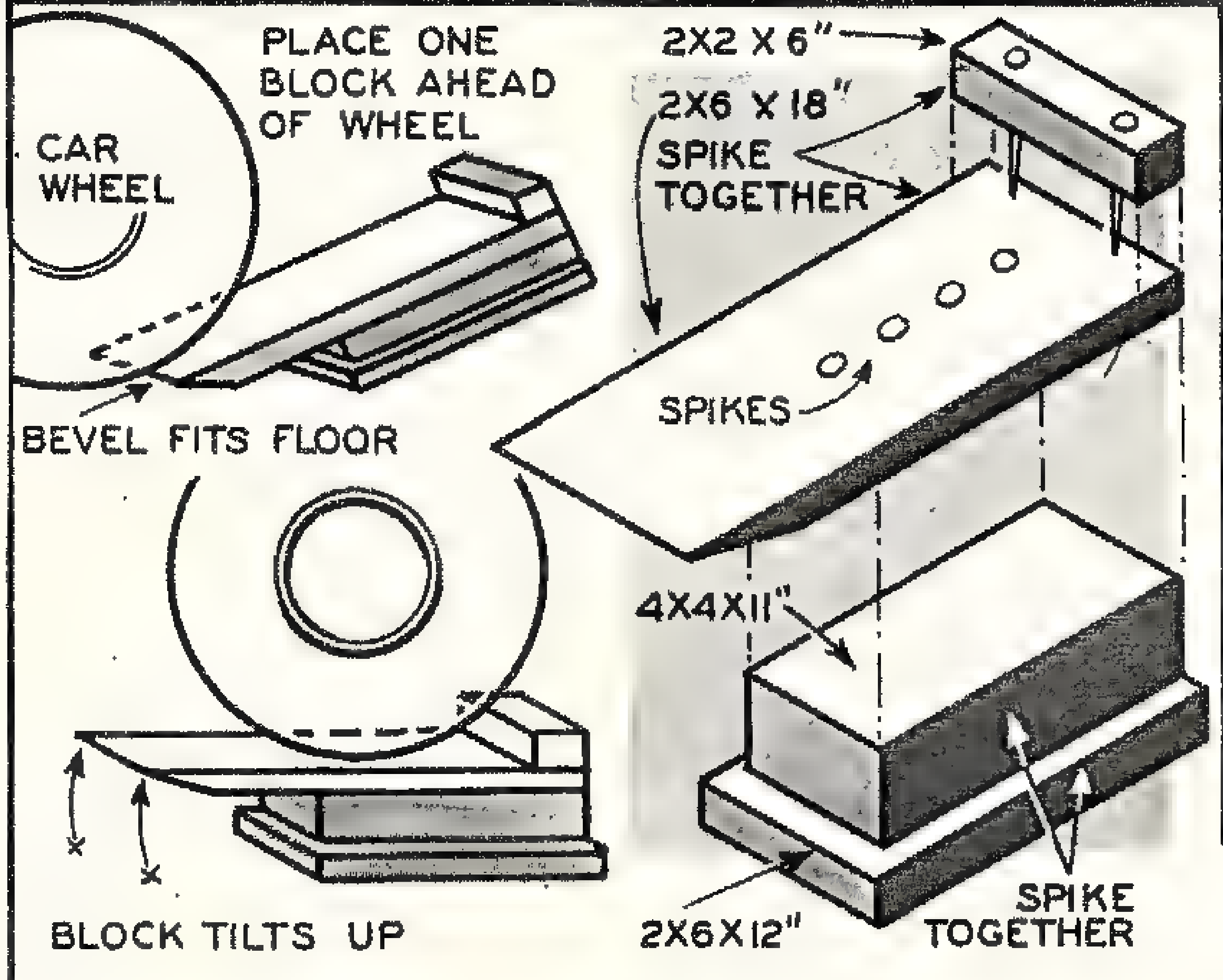
The two upper fuses have five lives—a twist and a new fuse is in the circuit. The fuse below is of conventional type—only one life.




ORDINARY TYPE OF PAINTERS' STIRRING PADDLE OR SIMPLE WOODEN SPLINT
IN-THE-WAY POSITION OF UNIMPROVED PADDLE
SPRING CLIP RIVETED TO PADDLE
FITS OVER SIDE OF PAINT CAN HOLDING PADDLE CLOSE TO CAN, OUT-OF-WAY
NATIONA
PA

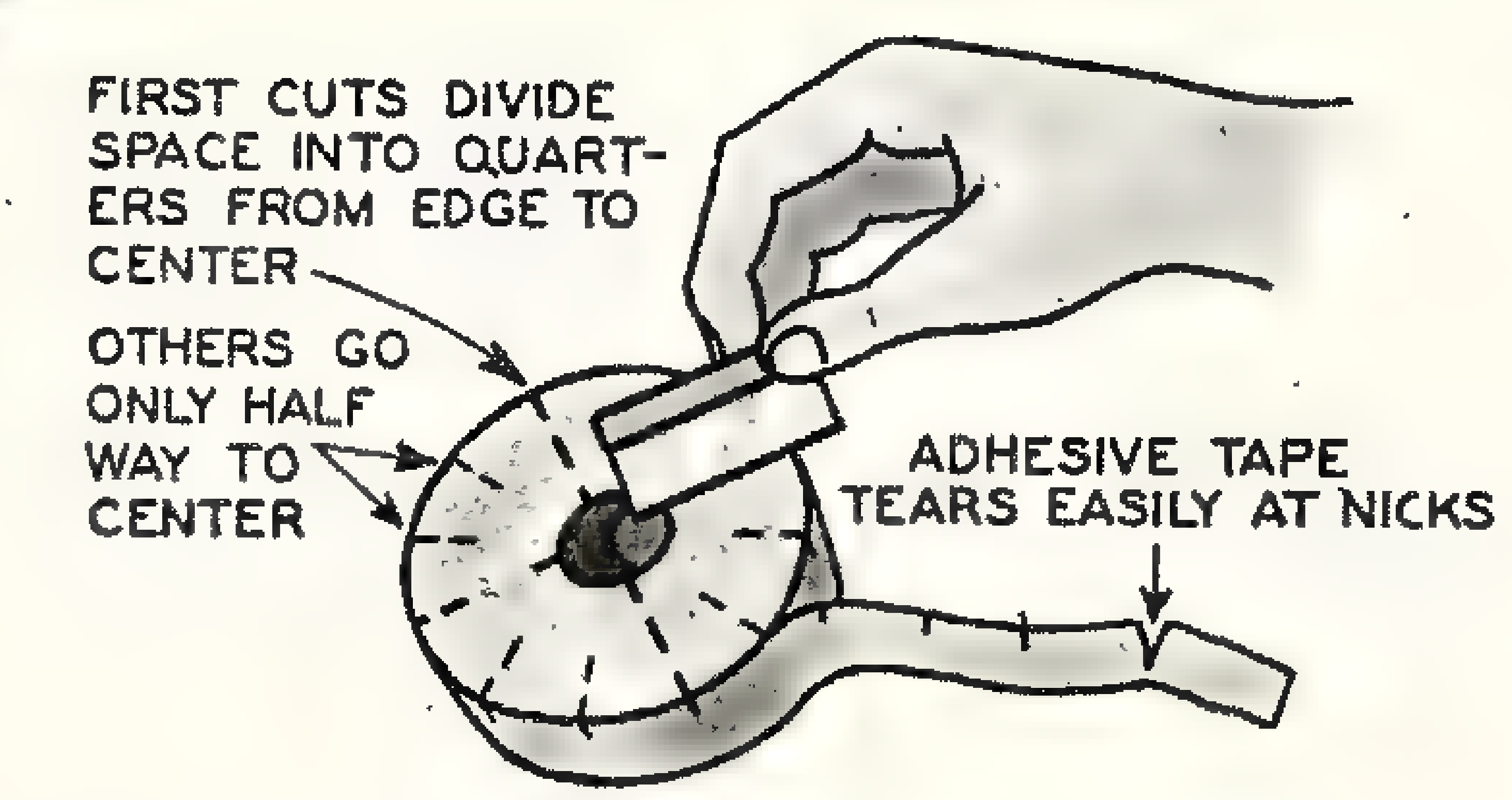
Clip Holds Paint Paddle

A SMALL spring clip fastened to the stirring paddle will make it possible to keep it out of the way when it is not needed. The clip should be just long enough to hold the paddle to the edge of the can. The paddle then is ready for instant use. The clip can be attached to a metal paddle or an ordinary wooden splint.


CAR WHEEL
PLACE ONE BLOCK AHEAD OF WHEEL
BEVEL FITS FLOOR
2X2 X 6"
2X6 X 18"
SPIKE TOGETHER
SPIKES
4X4X11"
BLOCK TILTS UP
2X6X12"
SPIKE TOGETHER

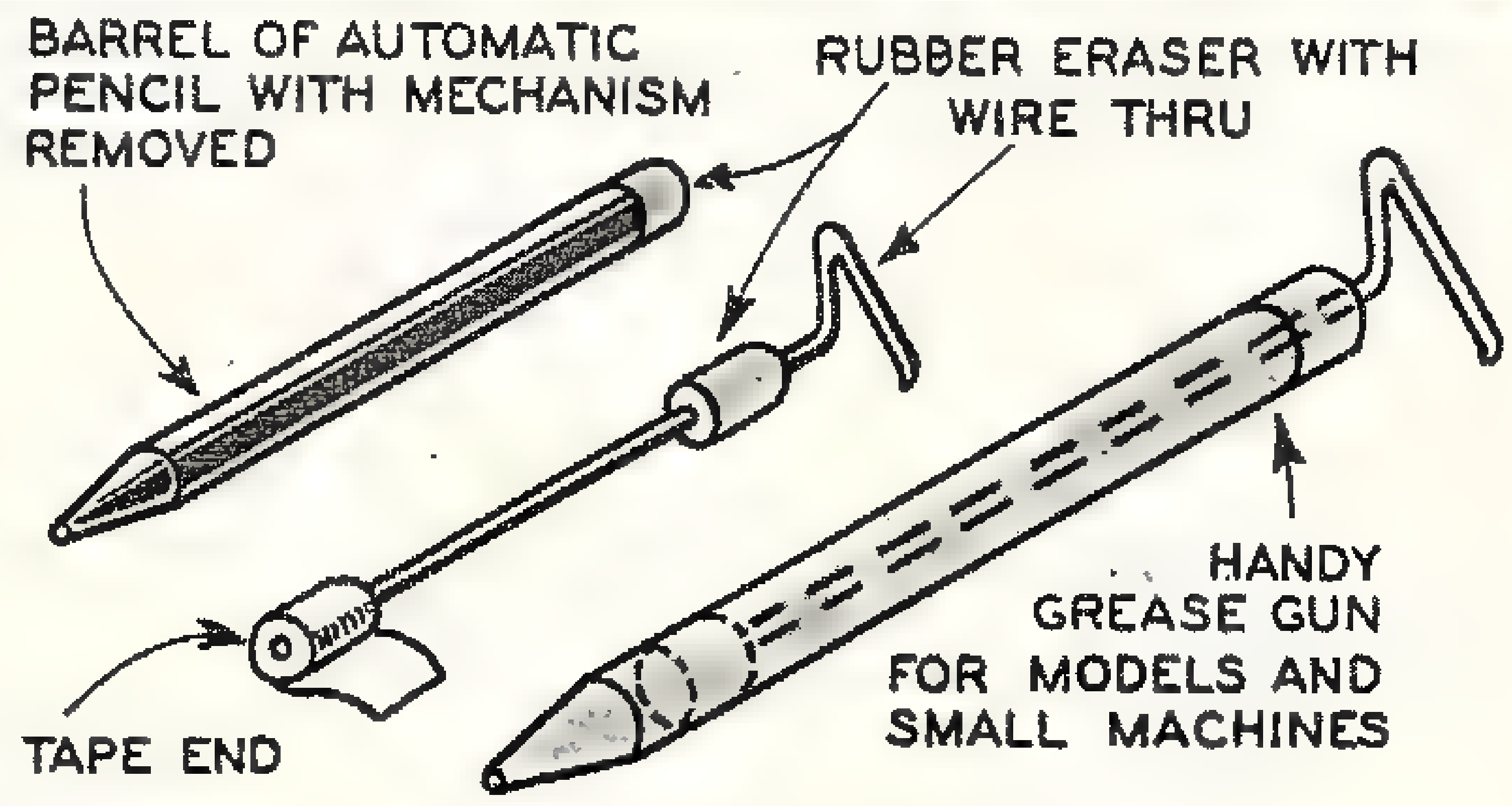
Car Jack Is Made Of Wood

THE car of today is designed to be so close to the ground that often it is difficult to crawl under it when work is necessary. A pair of blocks constructed as shown above completely eliminates this problem and makes it possible to raise either or both ends with no danger to the car. If higher lifts are used, the length and widths should be increased.


FIRST CUTS DIVIDE SPACE INTO QUARTERS FROM EDGE TO CENTER
OTHERS GO ONLY HALF WAY TO CENTER
ADHESIVE TAPE TEARS EASILY AT NICKS

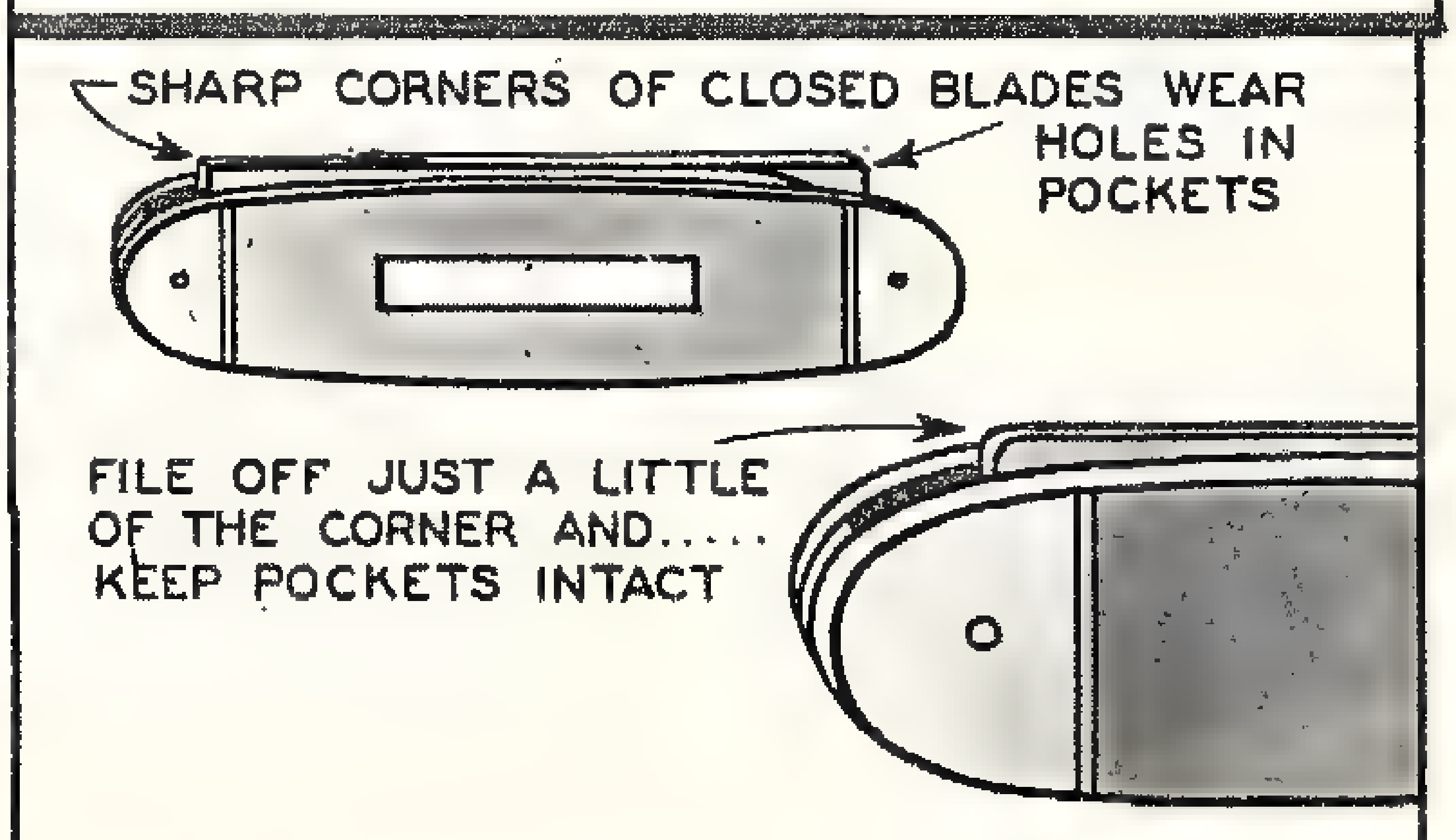
Small Cuts Improve Tape

STRIPS of tape can be torn from a roll easily if the edge of the roll is "nicked" with a sharp knife or razor blade as shown in the above drawing. Do not make the cuts too deep or they will weaken the tape.


BARREL OF AUTOMATIC PENCIL WITH MECHANISM REMOVED
RUBBER ERASER WITH WIRE THRU
TAPE END
HANDY GREASE GUN FOR MODELS AND SMALL MACHINES

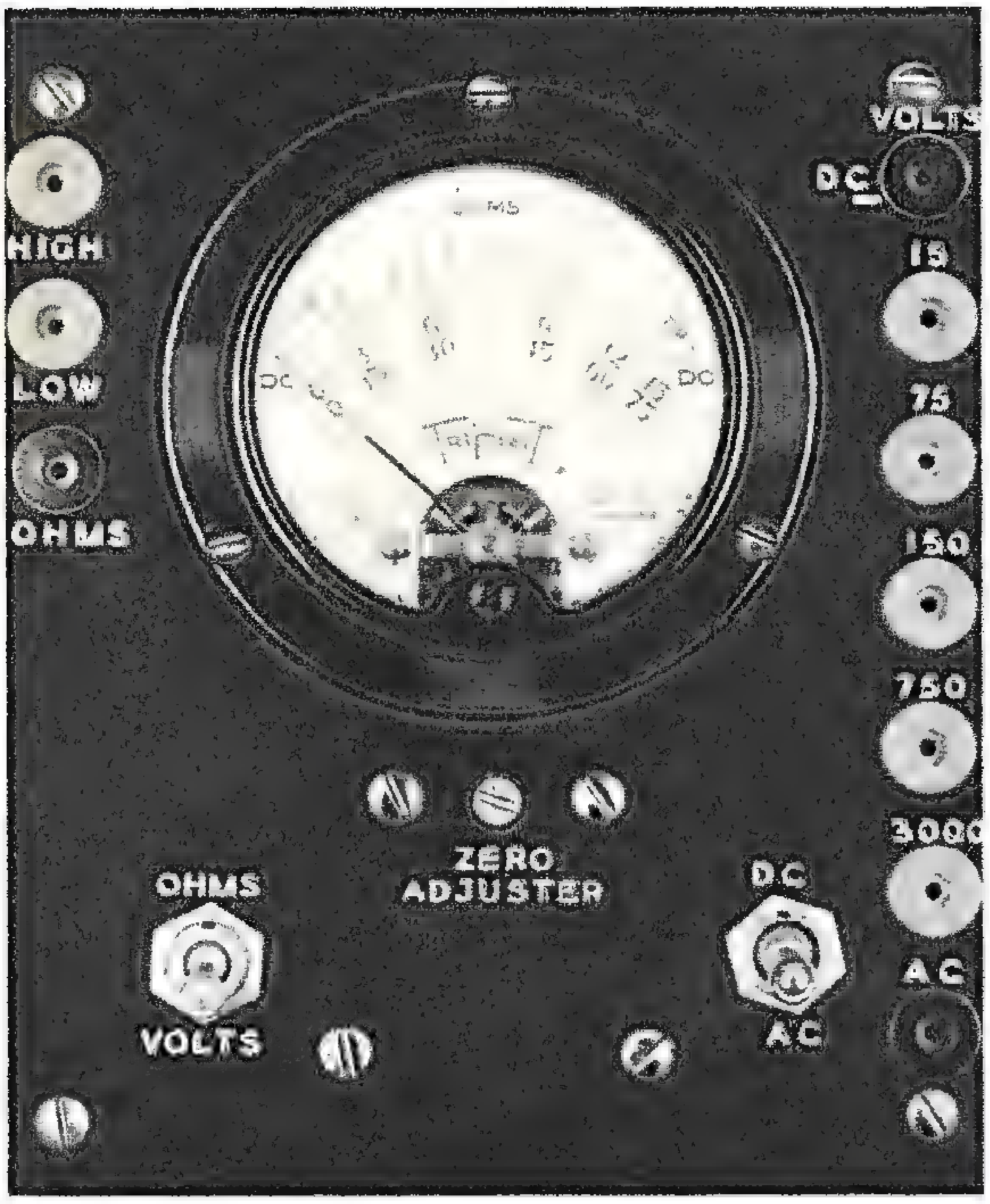
Pencil Becomes Grease Gun

THE barrel from an automatic pencil can be made into a small size grease gun suitable for lubricating delicate machinery or models. A plunger is made by wrapping a stiff piece of wire with friction tape to the correct diameter.


SHARP CORNERS OF CLOSED BLADES WEAR HOLES IN POCKETS
FILE OFF JUST A LITTLE OF THE CORNER AND..... KEEP POCKETS INTACT

File Rounds Blade Corner

THE sharp corner of most pocket knife blades can be removed easily and quickly by filing it smooth, thus eliminating the usual tendency to tear the pocket in which it is carried.



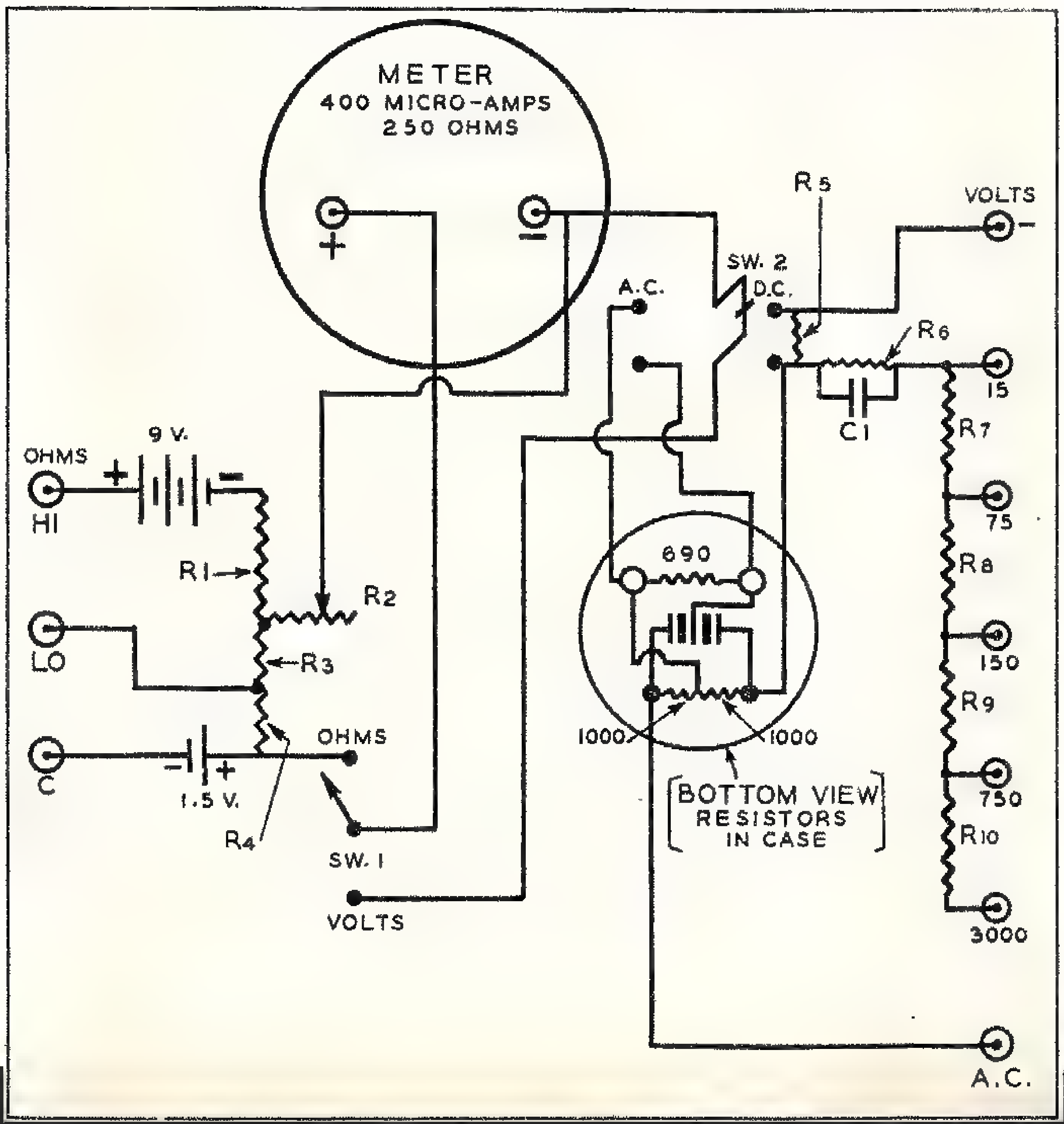
A GOOD multimeter is undeniably the most useful of all test instruments for anyone who works with electrical apparatus. Yet the high cost of the more elaborate commercial instruments has prevented many from purchasing such a device. Though the MECHANIX ILLUSTRATED "Testmaster" to be described is inexpensive and simple to build, it has been carefully engineered to give the utmost in ease and accuracy of operation and a wider range of application than many of the more expensive factory-built instruments now on the market. It is compact—scarcely more than a handful—yet it combines in a single unit the advantages of twelve individual instruments of equally high grade. And the total cost for all components is well under fifteen dollars. It won't become obsolete; a volt is always a volt, likewise ohms remain ohms as the years roll by. This instrument measures both volts and ohms over an unusually wide range and with ordinary care should last a lifetime.

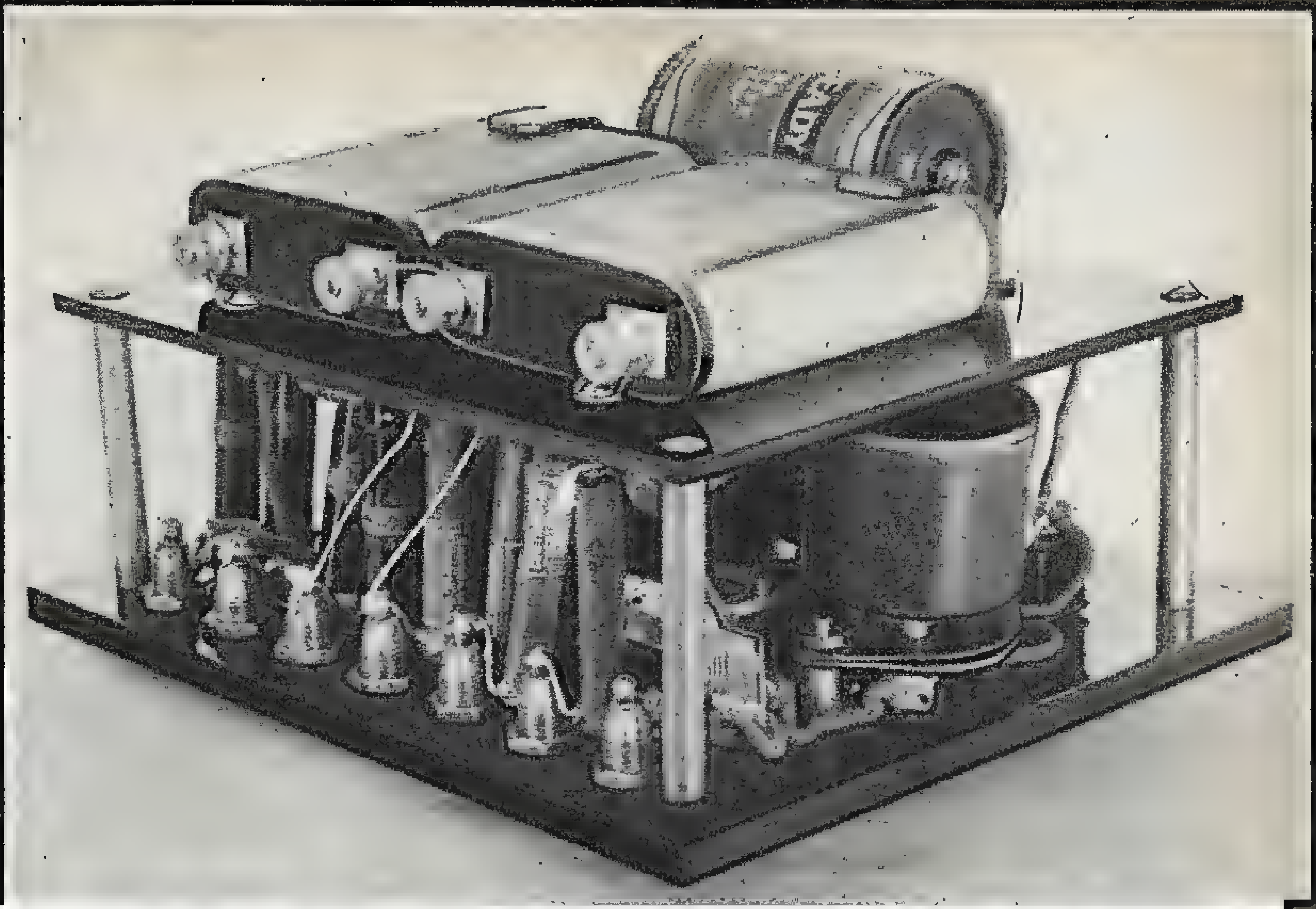
Not only will the radio and electrical experimenter find countless uses for the "Testmaster," but every person faced with any electrical problems will find it invaluable. Anyone troubled with too frequent light bulb burnouts may find the clue to the cause by testing the line voltage. The Testmaster's varied voltage scales—for both a.c. and d.c.—may show that the voltage is too high. The ohmmeter scale will settle problems in which a piece of electrical equipment is suspected of being burned out.

The heart of this instrument is the highly-sensitive but rugged bakelite-cased meter, which gives a full-scale deflection for 400 microamperes and has an internal resistance of 250 ohms. A knife-edge pointer enables readings to be made with precision over the various ohm and volt scales which are printed in red and black upon the dial. By the use of multipliers and shunts, five voltage ranges, from 15 to 3,000 volts, are secured. Switching

During the past few months many MI readers have written to us asking for information on amplifiers suitable for use with musical instruments. The result of all these letters will be found in next month's MI in the form of a complete how-to-build article on a musical instrument amplifier. Using only three tubes and contained in a single box with speaker, it has an output of approximately five watts—sufficient for medium size auditoriums. And this point will please many builders—it is not limited to use as a musical instrument amplifier. When desired, a microphone can be plugged in and the amplifier then can be used for speech, or, a phono-pickup can be substituted for the "mike" and the amplifier becomes an electric phonograph. Considering all its good points, we think this outfit is mighty good, and if you read the November issue of MECHANIX ILLUSTRATED you'll agree with us.

Above left—The completed Testmaster ready for use. It can be placed in a box for use on the workbench, or mounted in a panel above the table. Below—The wiring diagram. The a. c. rectifier with its parts are contained in a single unit. These parts are enclosed by a circle in the schematic diagram.





Build the M I TESTMASTER

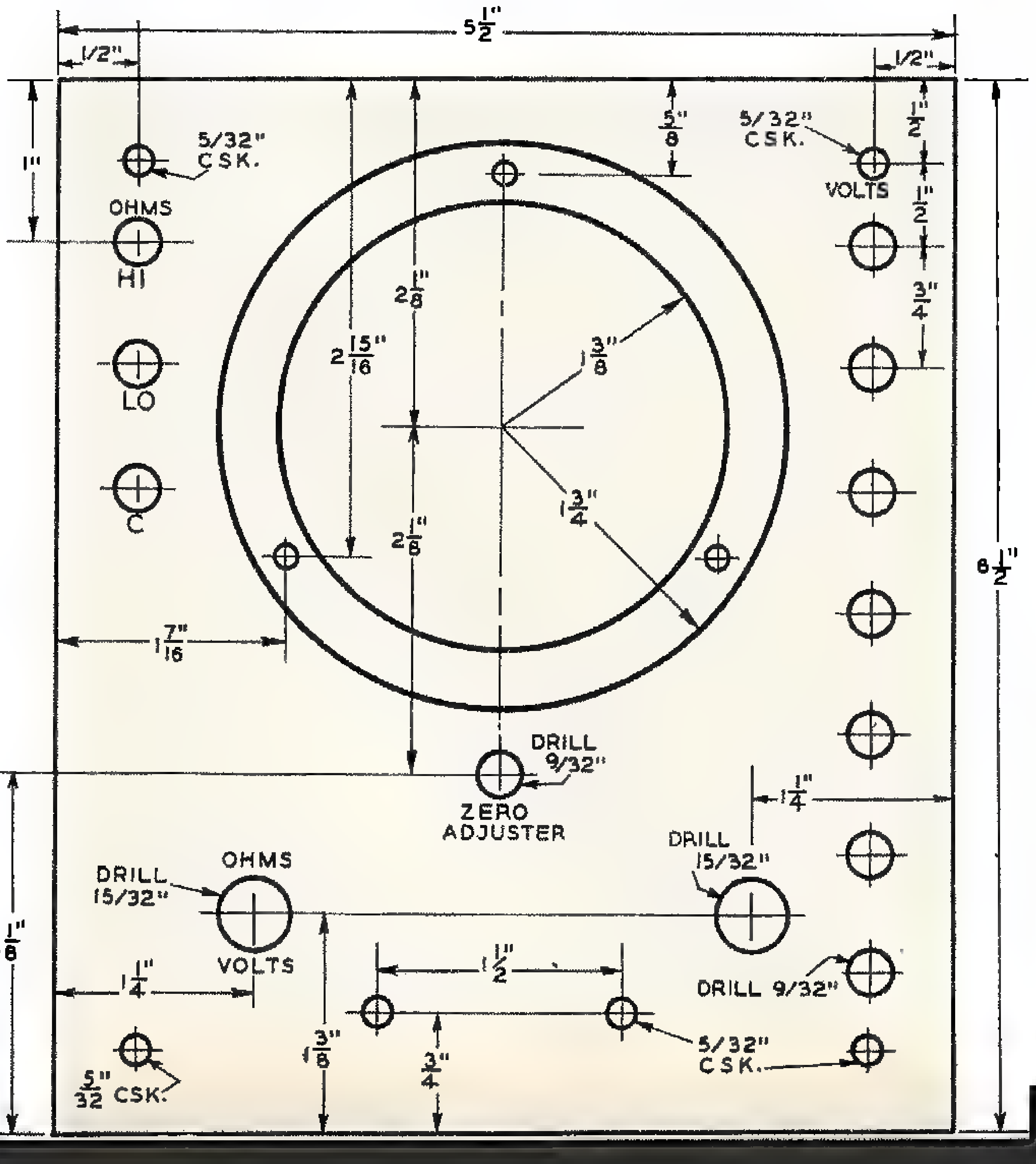
by John H. Potts

in a copper-oxide rectifier adapts the meter to a.c. measurements over the same number of ranges. All ranges, both a.c. and d.c., are covered at 1,000 ohms per volt.

Two ohmmeter ranges are provided. The "Low" scale is calibrated from 2 ohms to 15,000 ohms, while the "High" scale covers from 200 ohms to 1.5 megohms. The full

[*Continued on page* 136]

Above right—A photograph of the completed unit showing the parts. The rectifier is at the right, plugged into a 4-prong socket. Below—The panel layout showing locations of all holes to be drilled. The overall dimensions and positions of the parts can be varied to meet individual conditions.



Parts List

R1—Trutest wire-wound resistors 1—20,000 ohm and 1—2,000 ohm in series

R2—Midget potentiometer, wire-wound, 500 ohms

R3—Trutest wire-wound resistors 1—3,000 and 1—400 ohm in series

R4—Trutest wire-wound resistors 1—400 and 1—600 ohm in parallel

R5—Trutest wire-wound resistors 1—1,000 and 1—200 ohm in parallel

R6—Trutest wire-wound resistors 15,000 ohms

R7—Trutest wire-wound resistors 1—20,000 and 1—40,000 in series

R8—Continental Carbon semi-precision multiplier resistor, 75,000 ohms

R9—Continental Carbon semi-precision multiplier resistor, 600,000 ohms

R10—Continental Carbon semi-precision multiplier resistor, 3—750,000 ohms in series

C1—Tubular condenser, .05 mf., 200 volt

SW1—Single-pole, double-throw toggle switch, ½ inch shank

SW2—Double-pole, double-throw toggle switch, (included in meter kit)

Triplett Model 321 a.c.-d.c. Universal Meter, complete with copper-oxide rectifier, socket for same, and double-pole, double-throw toggle switch (SW2)

10—Bakelite Insulated ICA tip jacks (7—red, 3—black)

1—piece black Bakelite, 5½x6½x¼ inches (for front panel)

1—piece black Bakelite, 5x6x⅛ inches (for sub-panel)

2—Eveready type 781 4½-volt "C" batteries

1—Eveready type 950 1½-volt flashlight battery

1—pair ICA pencil-type test leads, No. 373

Brass tubing or rod, ¼ inch, 8 inches long, for four mounting posts

Brass strip, ½ inch wide, 1/16 inch thick, about one foot long, for brackets

Oval head and round head nickel plated brass screws, 6/32 with nuts

Push-back wire, assorted colors

FINDING THE WAY WHEN

by J. Julius Fanta

THE confusing nature of forests frequently causes the "tenderfoot" hunter or camper to become lost, only to spend much precious vacation time finding his way out. One may only venture a thousand feet or so into a dense forest, let alone penetrate the interior, and lose all sense of direction. Strange but true, the direction-confused outdoorsman often aggravates his predicament by unwittingly going the wrong way.

Others may profit by the writer's experience, the outcome of a deer and bear hunt near Quemado, New Mexico. Like many another hunter, it was taken for granted that the way back to camp could be found without difficulty. It was this over-certainty that increased the mental confusion as to certain trees which were too casually noted for bearings. This was definitely deterring, because in looking for those "certain trees" hundreds of others looked exactly alike.

Half sheets of white paper pierced onto twigs or underbrush make excellent trail markers, as the paper is easy to locate at night with a flashlight. Laying out the course of a hand-drawn map also helps in finding the return route to the camp site. Woodsmen prefer maps rather than trail markers.

The result was, upon the realization of being lost, that the hunting trip turned into a hunt for camp. The mighty forest of tall pine, spruce and hemlock spread for miles. There was no food or ready shelter at hand, except game the rifles could drop. It was too late to take bearings, as none were taken at the start.

The sun, moss on trees and other natural directional aids would have served perfectly,

LOST IN WOODS

if used at the outset. But they were ignored by plunging into the forest with deer and bear uppermost. The outbound trip ended at the brink of a canyon. Several hours of "going back" brought the hunting group to almost the same spot at the canyon. Cutting circles is a common occurrence for persons lost in a forest.

A rifle fired to attract attention was unanswered. No one else seemed to be in the vicinity. The afternoon passed and night came. One guess seemed as good as the next in determining bearings. Game was unsighted. Appetites bothered more than the plight. Darkness left no choice but to make preparations for an over-night stay.

A lean-to was built to provide improvised shelter by thatching a framework of saplings with light branches, leaves and grass. Fortunately, there were matches along to light a campfire, whose warmth substituted for blankets left at camp.

Dawn failed to furnish any helpful directional aid, the direction of camp having been unknown.

Crash! Crack! Bang! Clatter! The familiar sound of clattering pans and breaking of branches about 300 yards away sounded salvation. Haste was made toward the noise and lo! there was camp. And a black bear cub was seen scampering away, after breaking in for food and broadcasting welcome bearings.

This illustrates how near one may be to camp headquarters in a confusing forest, and yet be lost. The incident served to emphasize the necessity of mapping the way on future expeditions. With carefully recorded bearings, camp was found immediately after another jaunt that awarded a deer.

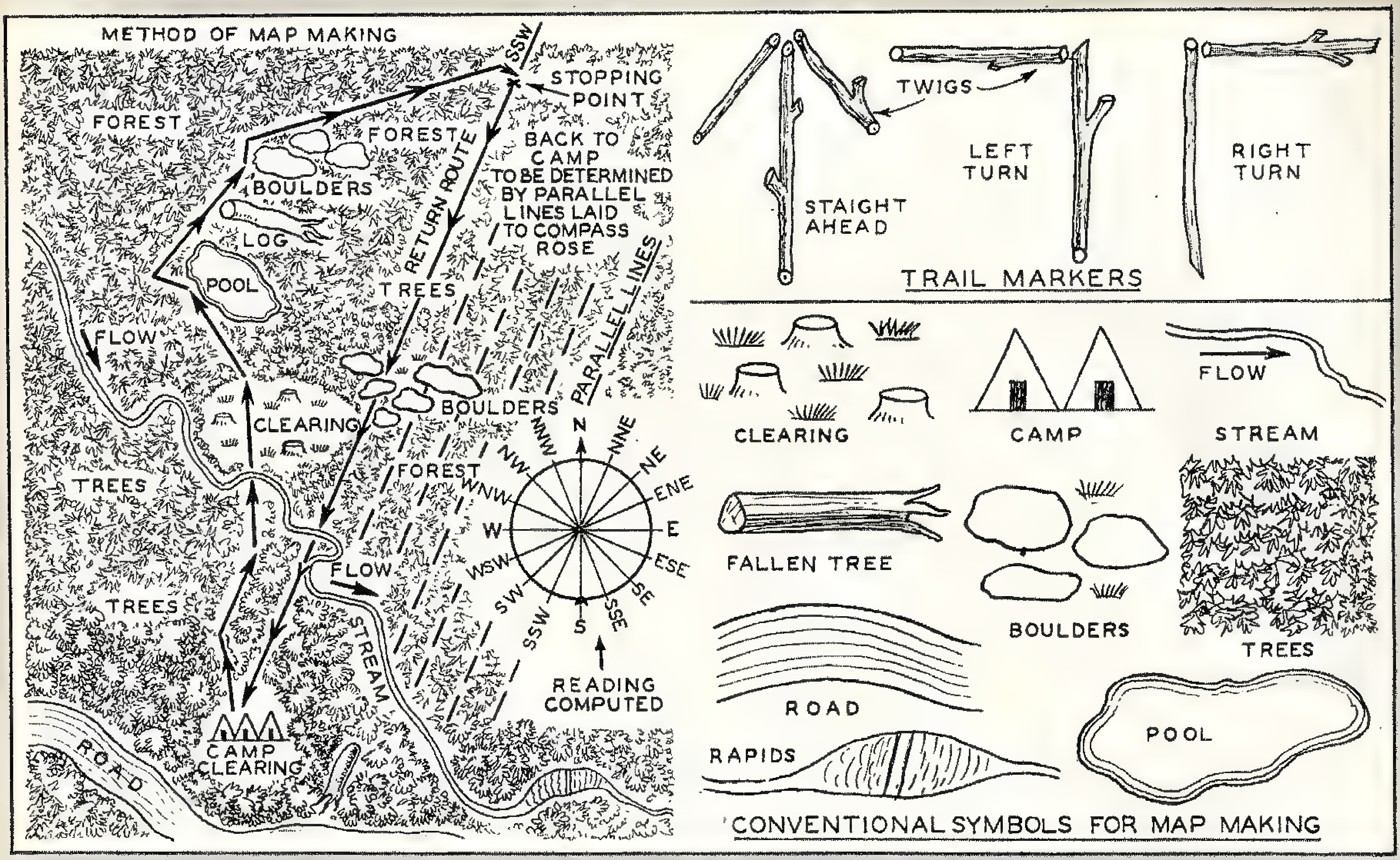
There are various ways of finding the way out of unfamiliar country where there are no landmarks to aid. A compass or a watch is indispensable on hunting and camping trips. With a compass, the directions may easily be determined while tramping, and the course retraced. If the course is frequently changed during a forest excursion, the length of time spent in going each direction should be noted and written down.

Be sure to note time taken out for rests and lunch. Then, using the opposite compass reading, a corresponding time is spent on each leg on the way back. That is, if the outbound course is northwest, the return would be southeast. The return of north-northeast would be south-southwest, etc.

If the departing course is roundabout over a series of logs, a short-cut route back to camp or starting point can be plotted by simple methods. Determine a straight return trip by accurately reproducing a compass "rose" on a drawn map.

Draw a straight line from the starting to the stopping point. Draw parallel lines to the line of proposed return route toward the compass rose until one intercepts the center of the rose. The line through the rose-center

When one is lost in the woods, a "lean to" shelter for protection against the elements can be built in a few hours. Lashed saplings and straw were used as materials in building this shelter.


METHOD OF MAP MAKING
SSW
STOPPING POINT
FOREST
FOREST
BACK TO CAMP TO BE DETERMINED BY PARALLEL LINES LAID TO COMPASS ROSE
BOULDERS
RETURN ROUTE
LOG
POOL
TREES
PARALLEL LINES
FLOW
CLEARING
BOULDERS
TREES
FOREST
N
NNW
NNE
NW
NE
WNW
ENE
W
E
WSW
ESE
SW
SE
SSW
S
SSE
FLOW
TREES
STREAM
READING COMPUTED
CAMP CLEARING
ROAD
TWIGS
STAIGHT AHEAD
LEFT TURN
RIGHT TURN
TRAIL MARKERS
CLEARING
CAMP
FLOW
STREAM
FALLEN TREE
BOULDERS
TREES
ROAD
RAPIDS
POOL
CONVENTIONAL SYMBOLS FOR MAP MAKING

With the aid of a compass, woodsmen can easily plot their course on a hand-drawn map. The map shown at left is similar to the one described in the article. At right are shown three popular trail markings, formed with twigs; below them, location symbols for maps.

gives the direction for returning. The accompanying sketch clarifies this point.

Blazing trees with an axe to mark the trail is helpful but injurious to the trees. Spare the trees and use chalk, an equally effective method. Pieces of paper pierced onto twigs of underbrush in conspicuous positions make another type of useful trail markers.

It is often practicable to sketch roughly a map while penetrating a dense forest, so that the outdoorsman can find the way back without loss of time. Make your own on paper or cardboard. Note all recognizable features, using first the road or camp as recorded points of departure.

In the forest, such natural aids as streams, fallen trees, clearings, hills, ditches, by-paths and fields of boulders are noticeable features worth mapping. Map them according to scale, if possible. When objects have confusing similarity, it is well to measure the distance between them by pacing. Figure about three feet to a good stride. By correspondingly checking the distances while returning, it will facilitate distinguishing various mapped points along the trail. This is especially true at night.

Woodsmen often use symbols to mark the trail; the hunter or camper will find them invaluable, too. Strange grounds can be marked with a series of arrows made of twigs. If the ground is bare, score symbols in the soil with a stick. In the accompanying sketches are a few suggested symbols for laying a trail.

In mountainous country, the rocky nature of the footing makes the symbols practically useless. The conventional way of marking a rocky trail is by painting white lines, about four inches wide and two feet long, on boulders and stones. A half pint of paint goes a long way and can be carried intact in a slightly larger pail with a handle. White paint enables the flashlight to pick up the trail readily at night.

Even experienced outdoorsmen in familiar country are forced to spend an unexpected night in the open after losing the trail. A like experience should not bring embarrassment or discomfort to the "tenderfoot." Dark

During the summer months most of us get enough exercise, but when winter rolls around, we are more likely to remain close to the fire and forget all about that exercise which made us feel so good during the summer. However, next month, MECHANIX ILLUSTRATED will include complete directions for a simple indoor bicycle exerciser. With it you can get all the exercise you want right in your own home. Don't miss that November issue—it's good.

nights make it almost futile to emerge from a forest without a trail. Foresight in bringing matches, food and an axe along adds comfort and shortens the night of waiting.

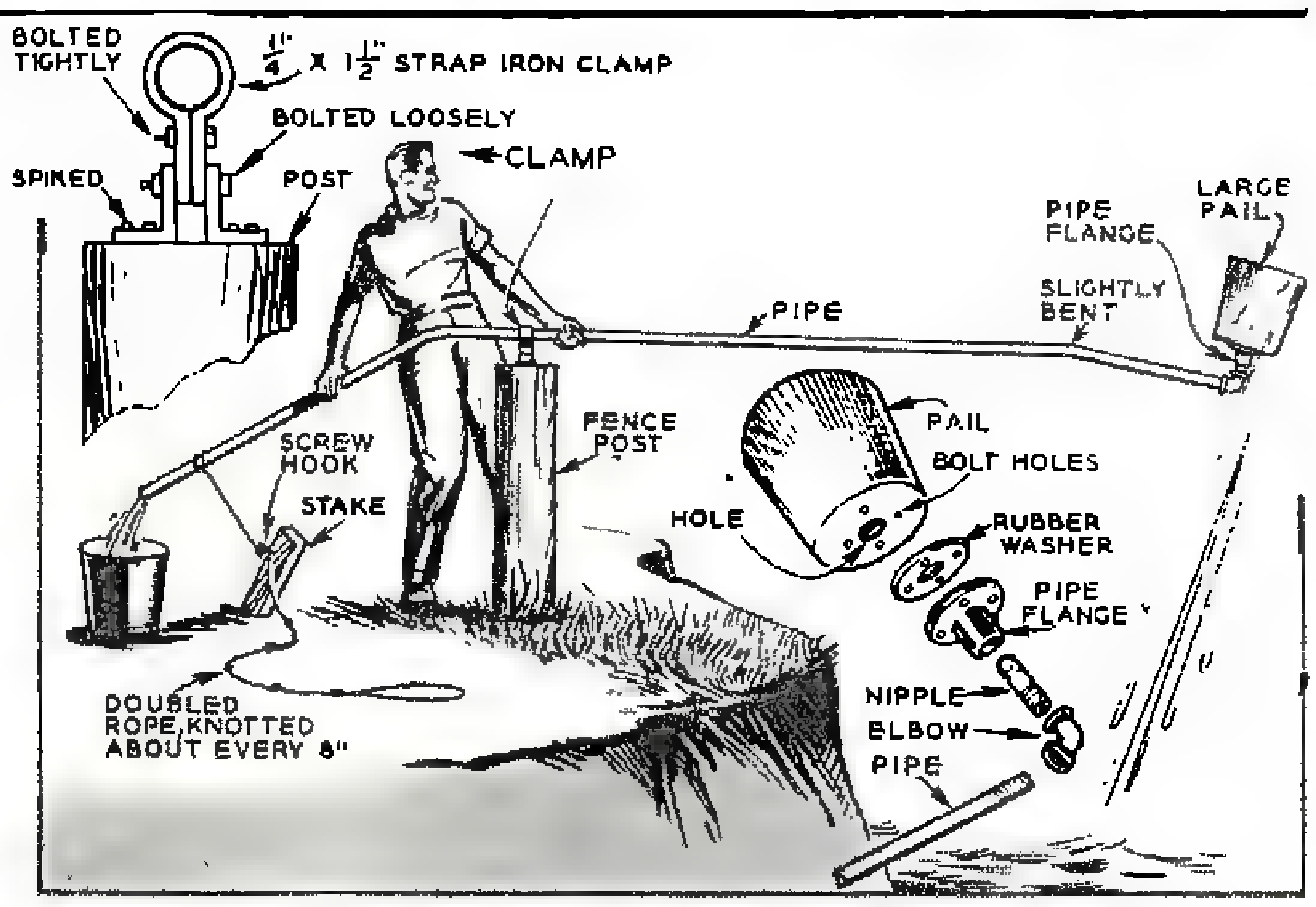
A typical camper's lean-to does much in protecting the lost from raw, cold winds as well as affording shelter from rain. A lean-to, as noted before, is an improvised shack. Its framework is built of light branches or logs, supported by two low-forked trees. Forked branches with ends embedded in the ground are equally adequate uprights.

When necessary, build the lean-to with the back towards the wind for protection. The open front admits the warmth of a campfire built at a safe distance, about six or eight feet. Lash cross-pieces to the sloping beams with cord, strips of bark or grass.

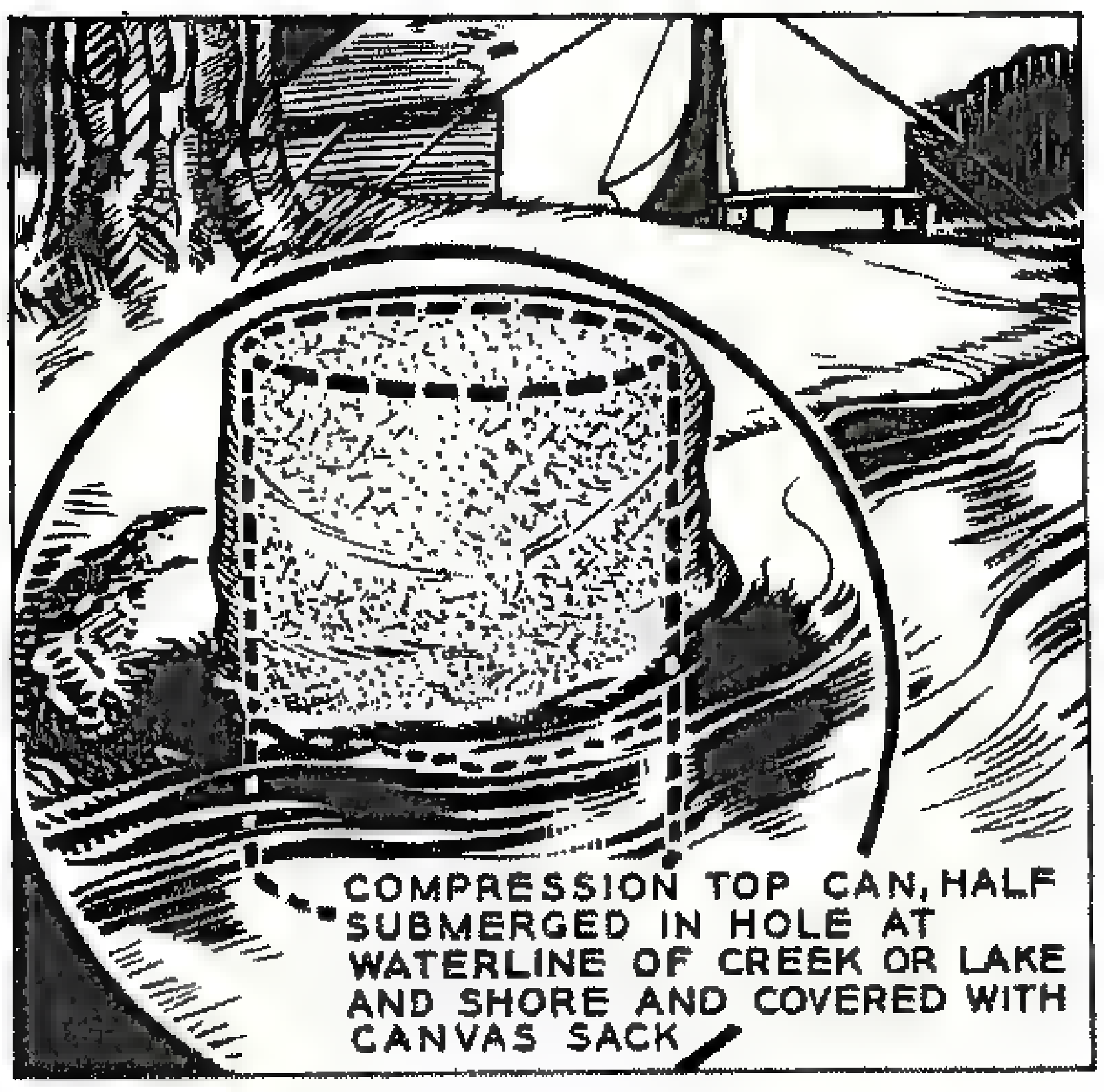
HANDIKINKS for the SPORTSMAN

Novel Water Dipping Device

SHOULD the camp of the vacationists, hunter or fisherman be situated on a river or lake where the bank is too steep for conveniently obtaining water by hand, the mechanism illustrated will be of inestimable convenience. A large pail, a length of heavy water pipe and a few pipe fittings are the only materials required for building the dipper. Cut a hole in bottom of the pail, attach flange and washers and couple to the water pipe as shown.


BOLTED TIGHTLY
$\frac{1}{4}$" X $1\frac{1}{2}$" STRAP IRON CLAMP
BOLTED LOOSELY
CLAMP
SPIKED
POST
LARGE PAIL
PIPE FLANGE
SLIGHTLY BENT
PIPE
FENCE POST
SCREW HOOK
STAKE
PAIL
BOLT HOLES
HOLE
RUBBER WASHER
PIPE FLANGE
NIPPLE
ELBOW
PIPE
DOUBLED ROPE, KNOTTED ABOUT EVERY 8"

Buried Can Keeps Food Fresh


COMPRESSION TOP CAN, HALF SUBMERGED IN HOLE AT WATERLINE OF CREEK OR LAKE AND SHORE AND COVERED WITH CANVAS SACK

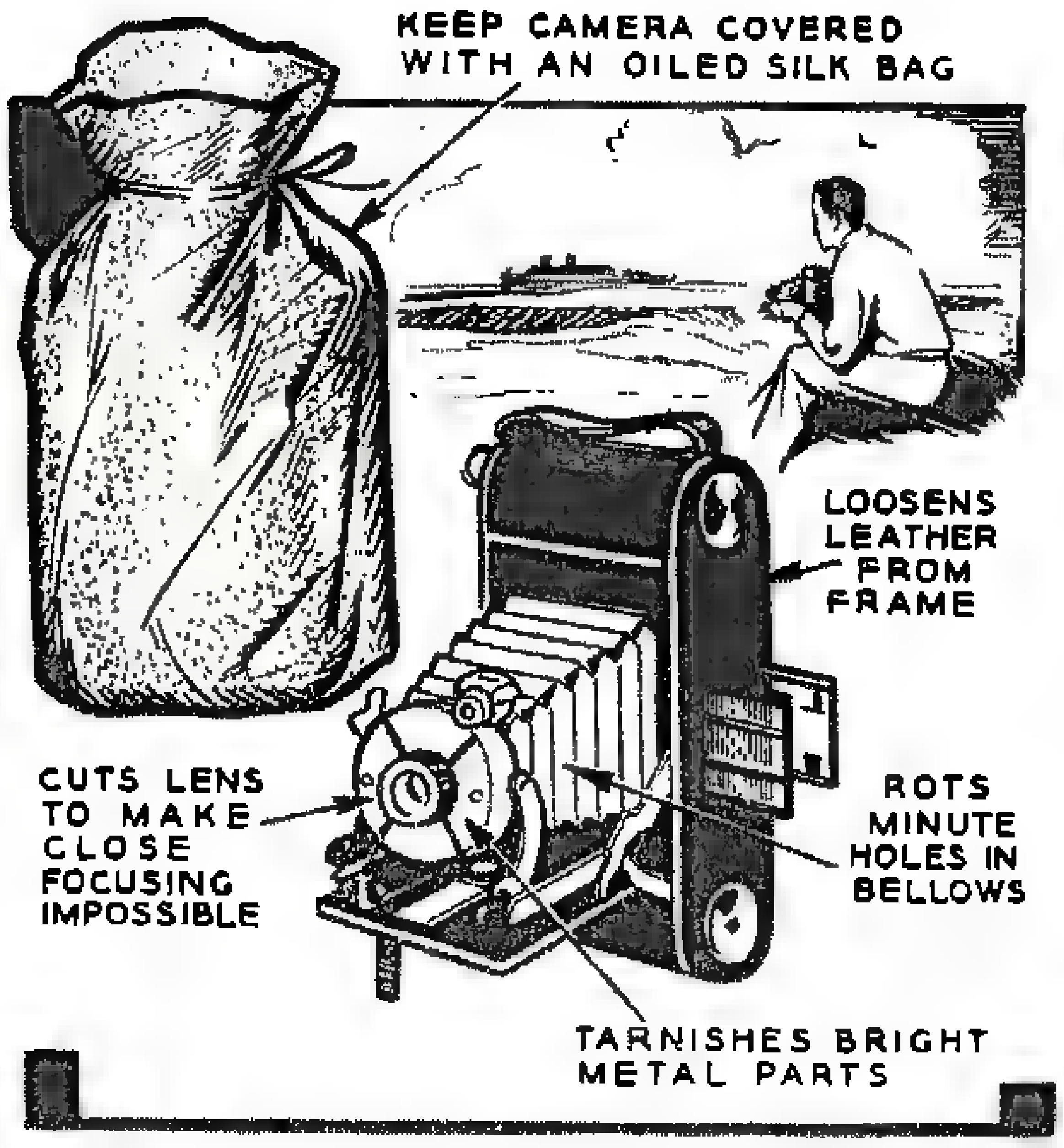
PERISHABLE foods can be kept in good condition during hot weather if they are packed in a large tin can having a compression or friction lid. The can should be buried in a hole dug near the water line of a lake or creek and covered with a canvas sack whose lower edges are allowed to protrude into the stream.

In very warm weather dig the hole at a point along the stream where there are overhanging branches that will protect the can shading from the hot rays of the sun. —R. A. Harris.

Protecting Camera From Salt Air

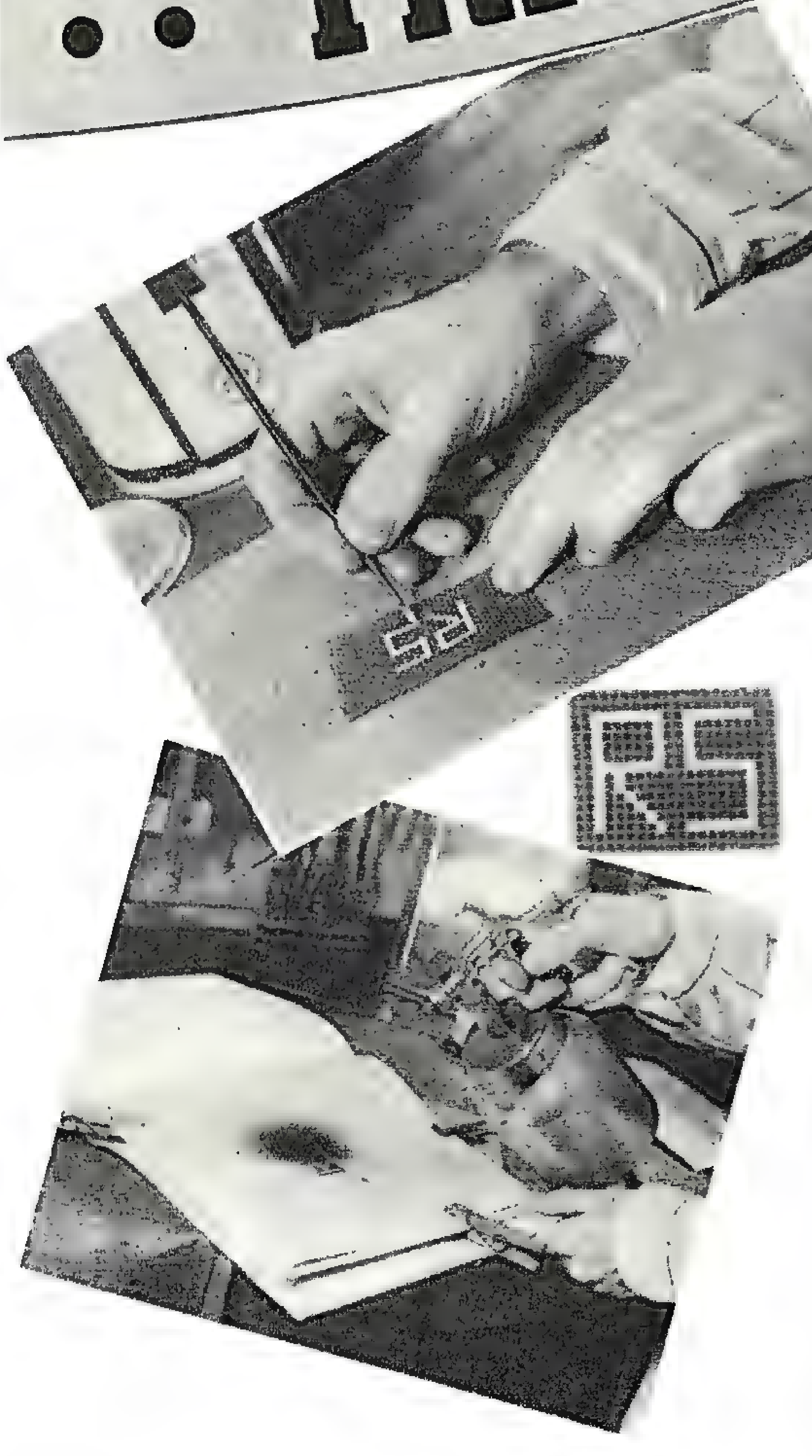
SPORTSMEN whose hobby is taking pictures of their summer vacation jaunts often fail to realize the importance of protecting the camera when using it near salt water. Unless the camera is kept in an oiled silk bag it will be affected by the damp, salt-laden air. Corrosion of metal parts, rotting bellows and lens troubles are certain to develop unless the camera is well cared for.

Each time after it is used wipe the lens with a camel's hair brush and clean the bellows with a soft cloth so that all minute particles of salt are removed. Metal parts should be cleaned in the same manner, then rubbed with a cloth moistened with a light lubricating oil. Last, place the camera in the oiled silk bag and pull the draw strings tight.—J. Emmett.


KEEP CAMERA COVERED WITH AN OILED SILK BAG
LOOSENS LEATHER FROM FRAME
CUTS LENS TO MAKE CLOSE FOCUSING IMPOSSIBLE
ROTS MINUTE HOLES IN BELLOWS
TARNISHES BRIGHT METAL PARTS

How to use lacquer to produce very attractive finishes.

TRICKS WITH A



Letters or designs painted on wire screening make an interesting stencil. This is useful for giving books permanent ownership identification.

by Walter E. Burton

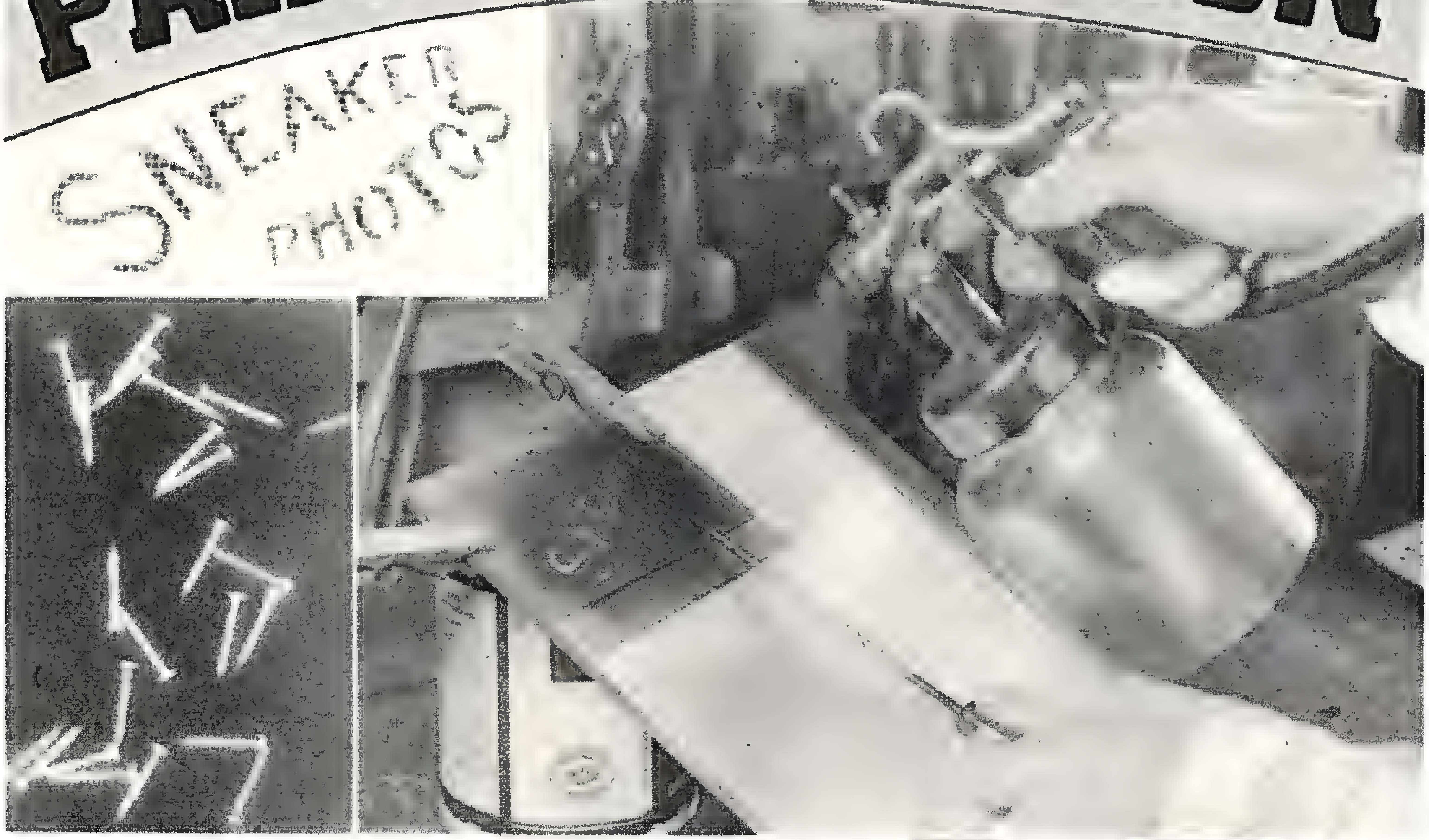
INEXPENSIVE paint-spray guns, operated usually by small motor-driven compressors, offer to the home-workshop owner a means of producing distinctly novel and attractive finishes on various objects, in addition to those obtained by usual straight spray-painting methods.

For most of the stunts to be described, quick-drying lacquers are to be preferred to the slower-setting spraying enamels. In most cases, the lacquer should be made water-like in consistency by adding a little more than the usual amount of thinner. Set the gun so that it gives a very fine, misty spray.

Almost unlimited are the effects to be obtained from using stencils, and various objects and materials that act as stencils by preventing the depositing of lacquer on some areas while permitting it in others. A piece of ordinary screenwire can be used to give novel effects. Hold it flat against the work, direct the spray squarely against it, and you will produce a clean-cut pattern of the wire. By holding the gun so that the spray strikes the

PAINT-SPRAY GUN

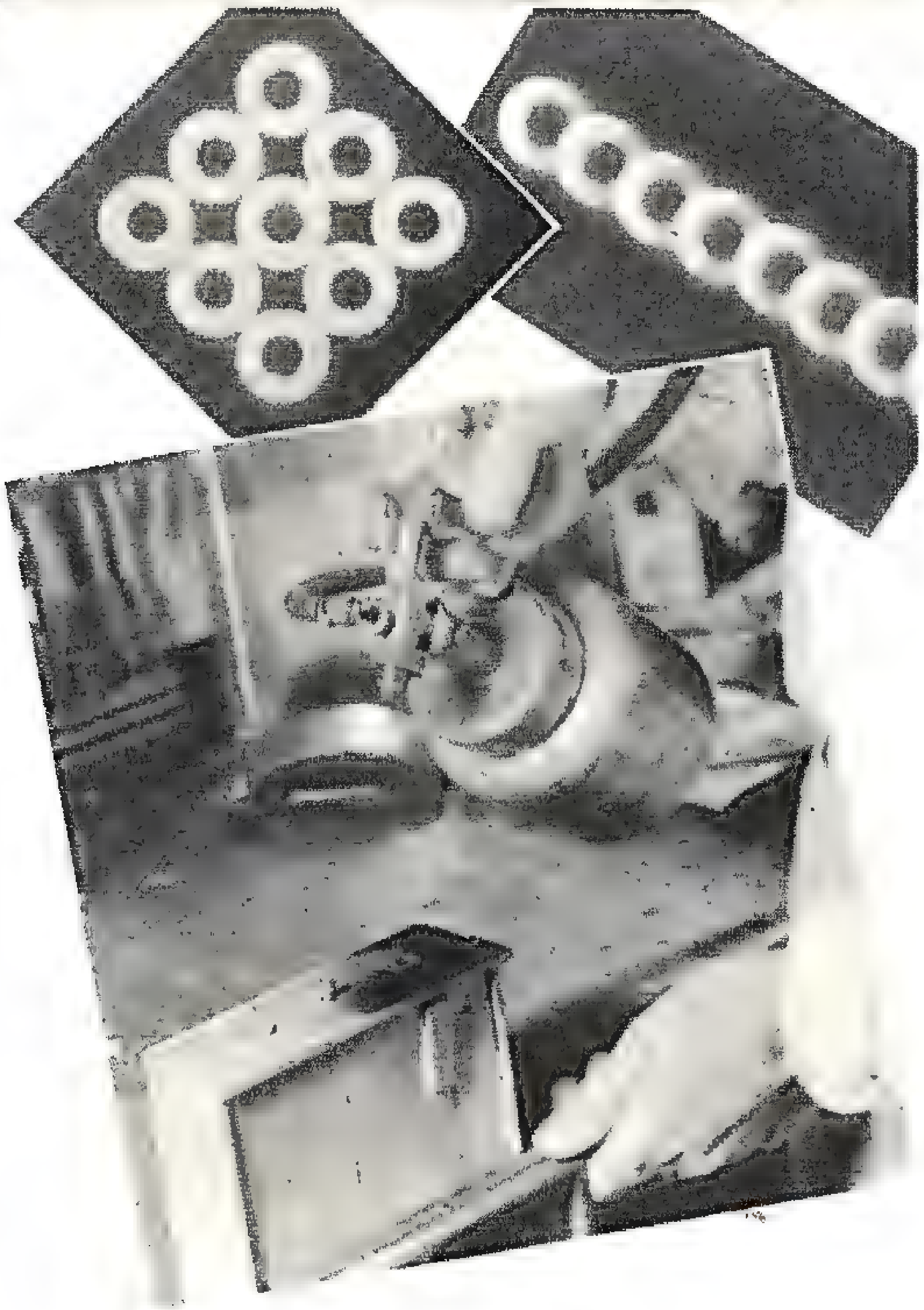
SNEAKER PHOTOS



wire at a sharp angle instead of perpendicularly, you obtain an entirely different effect. Support the wire a small fraction of an inch from the work, and still another effect is obtained.

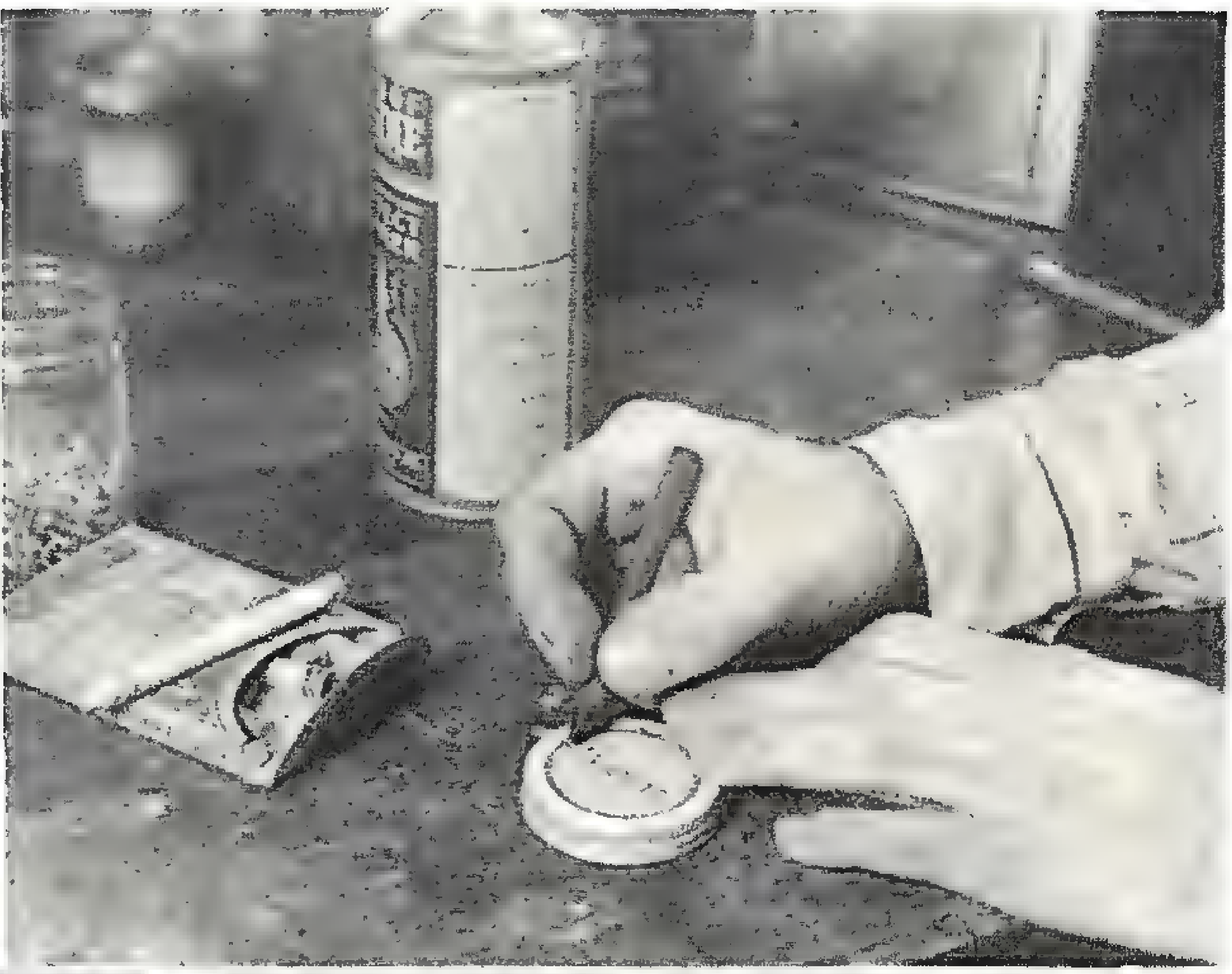
It is an easy matter to make stencils for producing designs and lettering, by filling some of the squares in a piece of screenwire with some material that will prevent the lacquer spray from reaching the surface being painted. One suitable material is spraying-enamel undercoater or the enamel itself. These are not readily softened by the lacquer solvent. However, with care, almost any paint or lacquer can be employed. Use a small artist's brush for filling the openings; do not have the filler too thin. When the filler has dried, simply hold the screenwire stencil against the surface to be painted, and direct the spray squarely toward it. Do not apply too heavy a coat, and do not attempt to move the stencil until the lacquer has set so that it will not smear. The resulting pattern will be composed of unpainted letters or figures against a background divided into small squares.

Another trick is to use an ordinary stencil cut from heavy paper or thin cardboard, and



Simple objects such as nails or washers make good stencils for the paint spray gun. By changing the direction of the paint spray, design can be varied to give desired effect.

When the usual stencil cannot be used for lettering, wax crayon makes a good substitute. After the design is drawn, spray lacquer evenly over lettering and rest of the area. When it has set but is not hard, wash over it with a cloth wet with carbon tetrachloride. This removes crayon wax with lacquer over it.



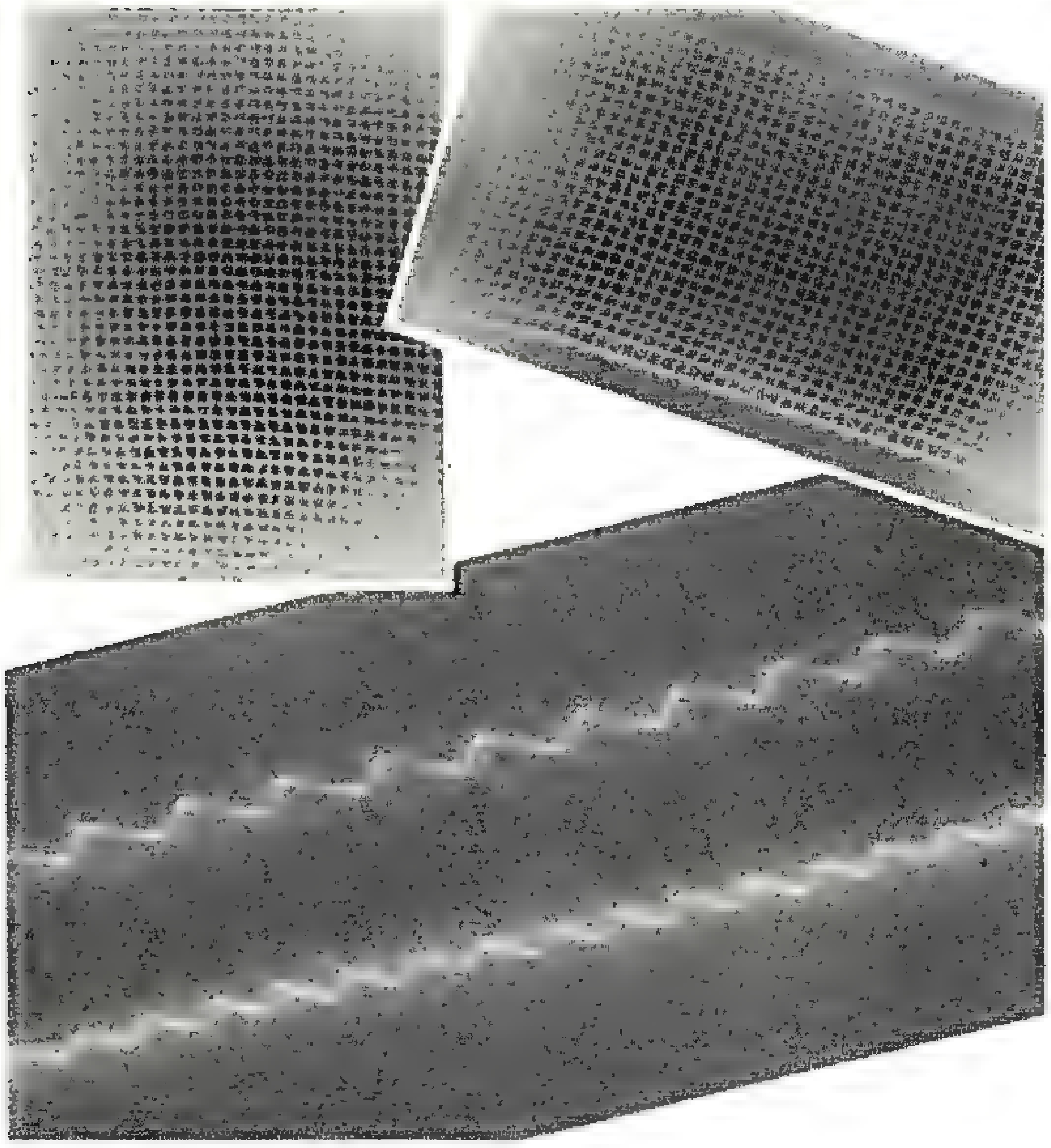
lay over it a piece of screenwire. The pattern, instead of being solidly painted, will be broken up into small squares, resembling fabric. Polychrome effects can be produced by blending different colors.

Sheets of perforated metal, available in an almost endless number of designs, may be used as a substitute for screenwire. Clean the wire or metal occasionally with lacquer thinner.

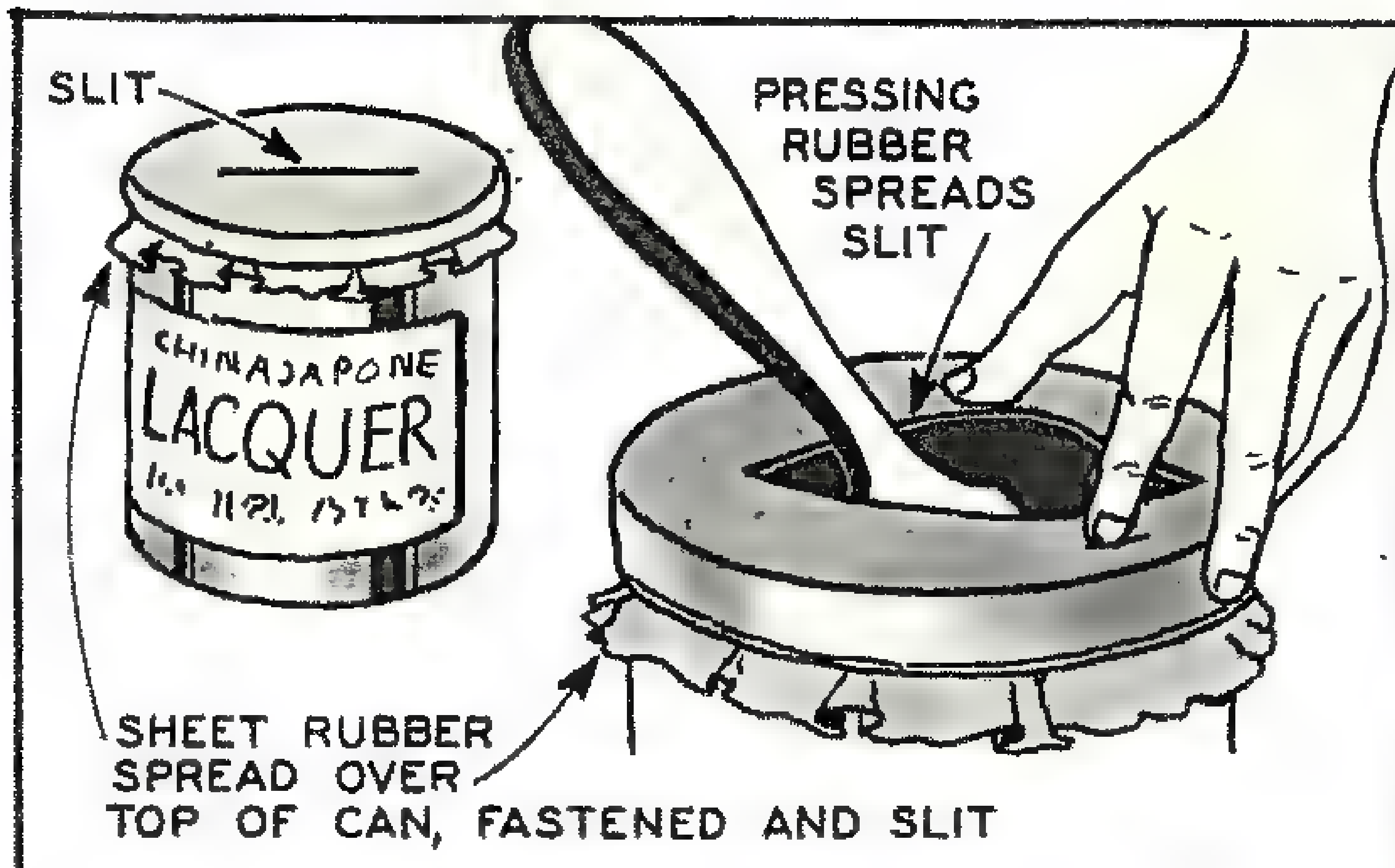
By scattering such objects as small nails, washers, screws, and discs of various sizes over the surface, and holding the spray gun so that the air blast does not cause them to move, an endless variety of effects can be produced. These objects cast "shadows" by preventing the lacquer from reaching the surface beneath them. They can be arranged in definite patterns, or scattered haphazardly over the surface. Objects appropriate to the thing being painted should be used.

[*Continued on page* 136]

Next month MECHANIX ILLUSTRATED will give metal working fans a simple, but one of the most attractive projects they have seen in a long time. It is a copper entrance lantern—just perfect for hanging over that front door which needs a light. It's in the November issue—don't miss it.

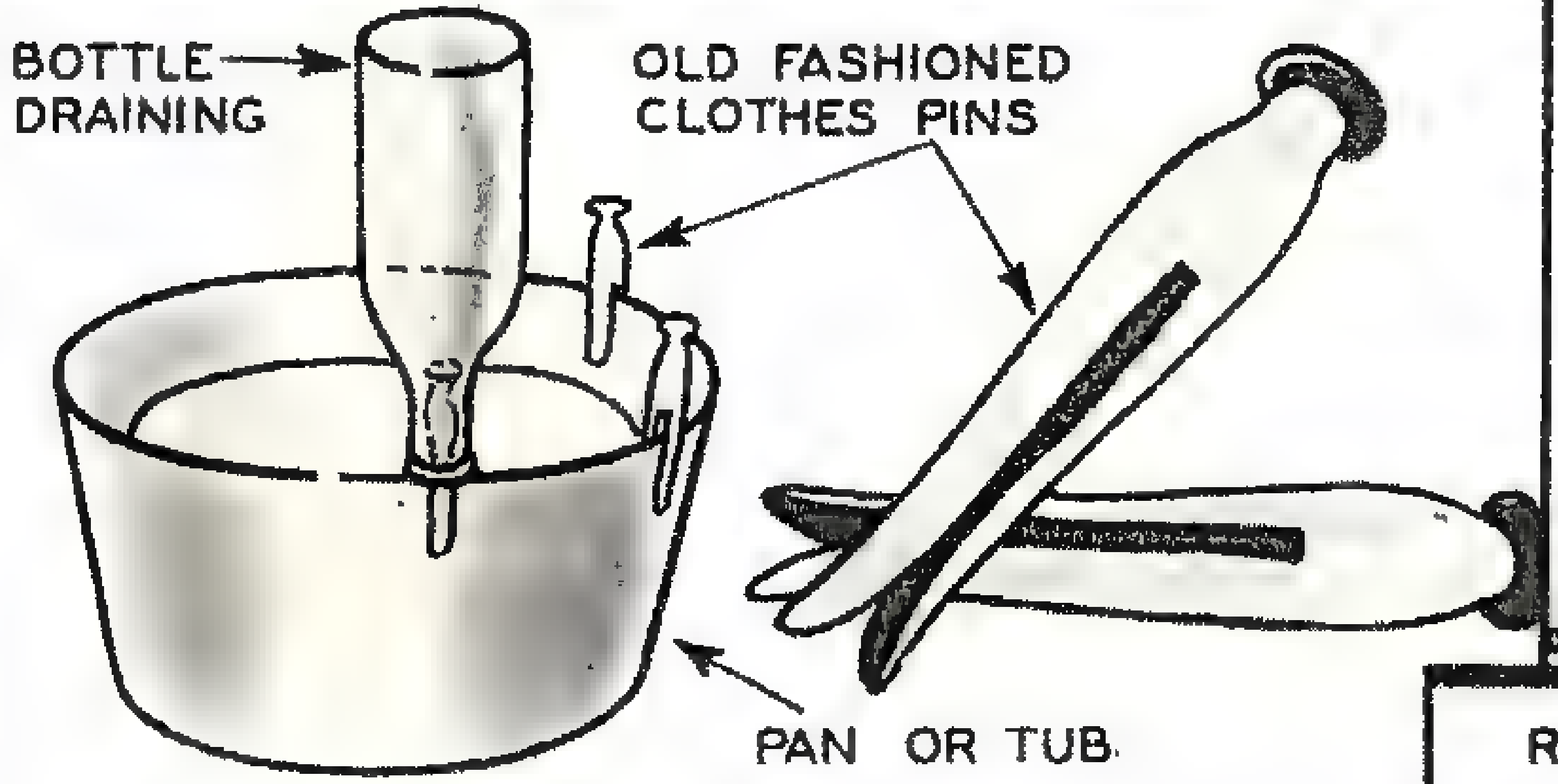


Above are samples of work done with a paint spray gun. A piece of screen wire may be used to give many novel effects. By holding the wire securely against the work, and with the spray gun pointed directly at it, a clean cut pattern of the wire will result. If the wire is lifted slightly, a different pattern will be obtained, very unusual in appearance.


SLIT
PRESSING RUBBER SPREADS SLIT
CHINAJAPONE
LACQUER
SHEET RUBBER SPREAD OVER TOP OF CAN, FASTENED AND SLIT

Rubber Makes Good Cover

A PIECE of thin rubber with a slit in it becomes a good cover for fast drying liquids. The brush can be dipped into the liquid and the cover will close as soon as it is taken out.

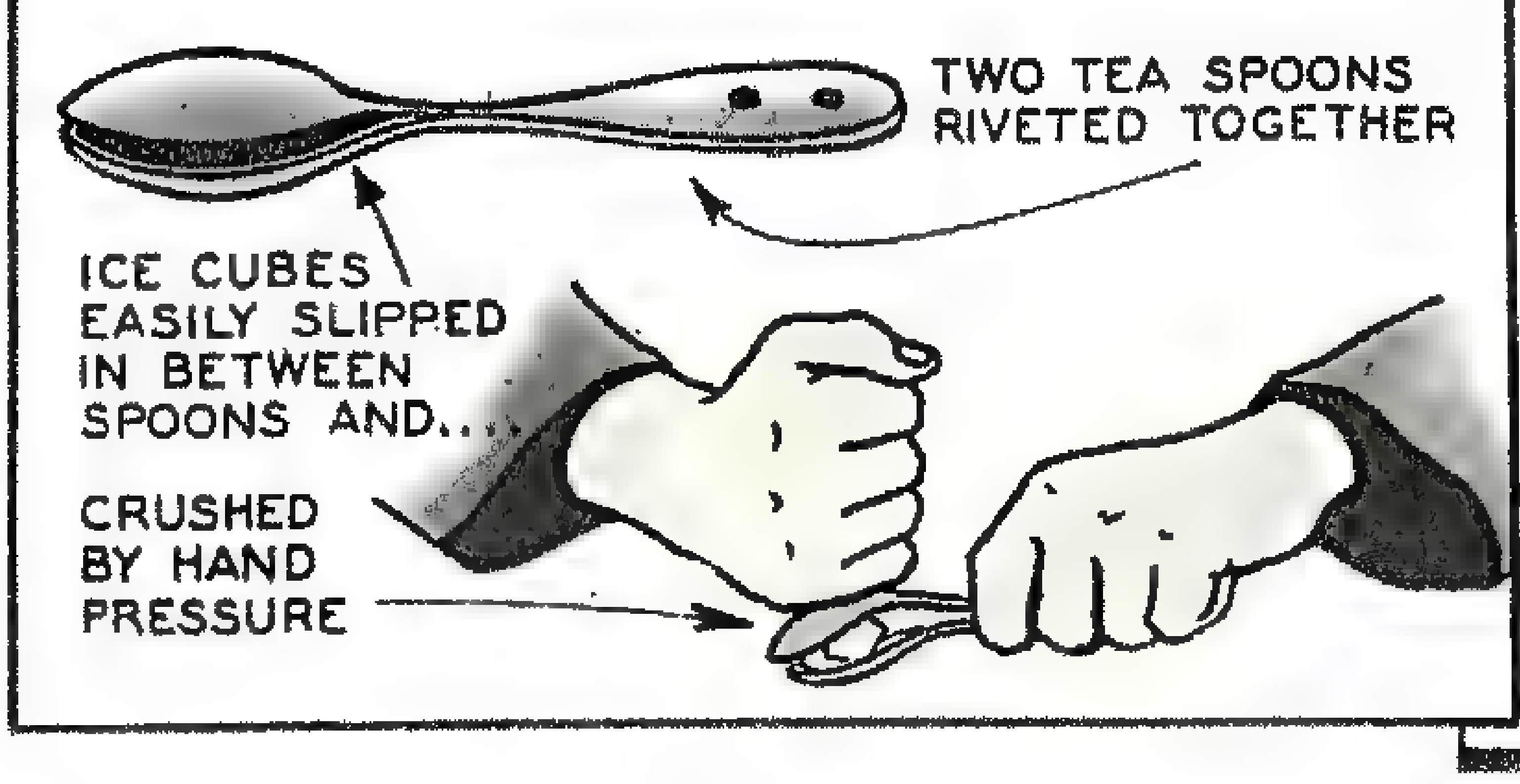

BOTTLE DRAINING
OLD FASHIONED CLOTHES PINS
PAN OR TUB

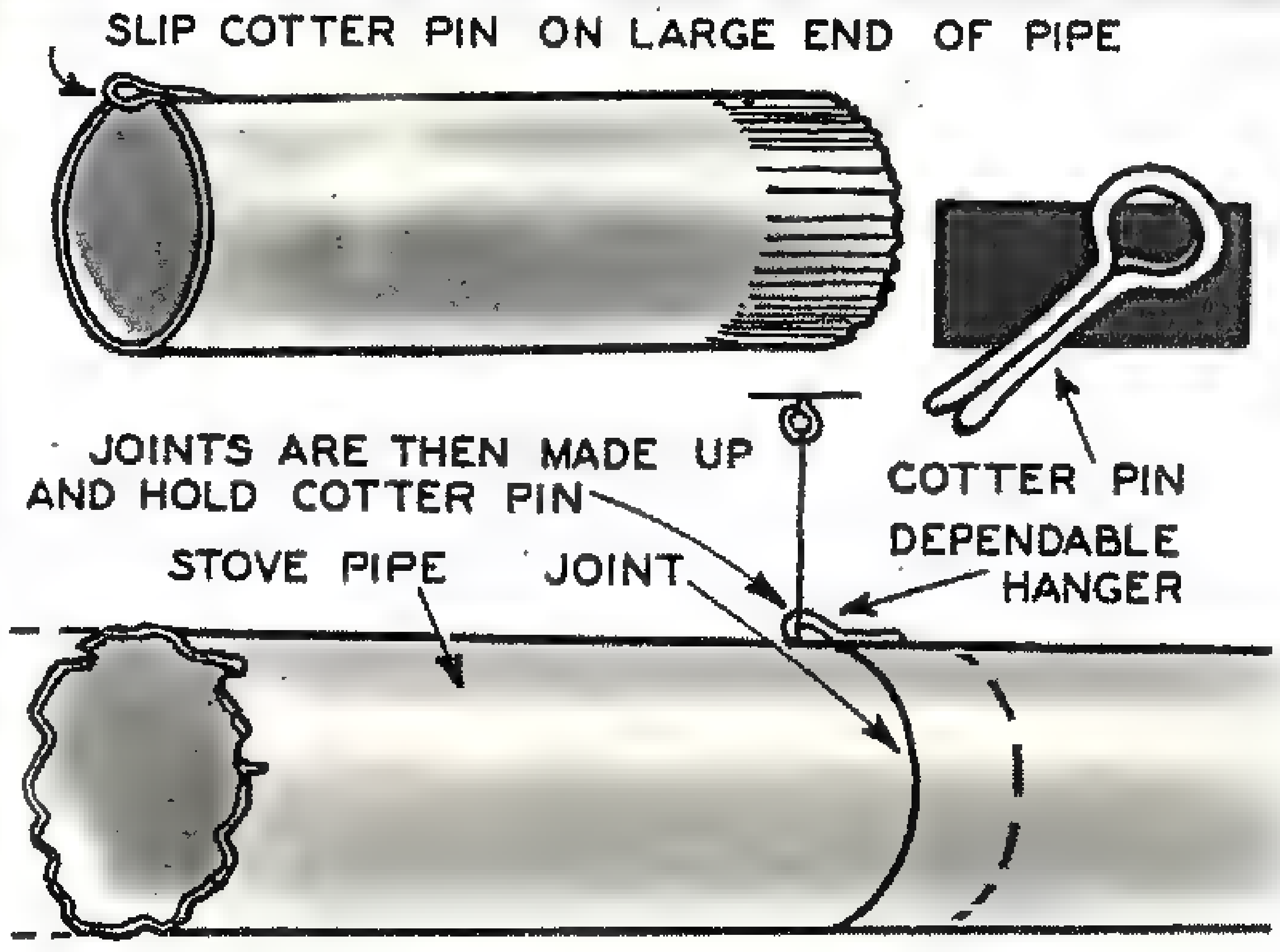
Wood Pins Aid Bottle Drying

THE task of bottle washing can be simplified considerably by fastening several clothespins to the edge of a pan and standing the bottles, neck down, over them.

Spoons Become Ice Crusher

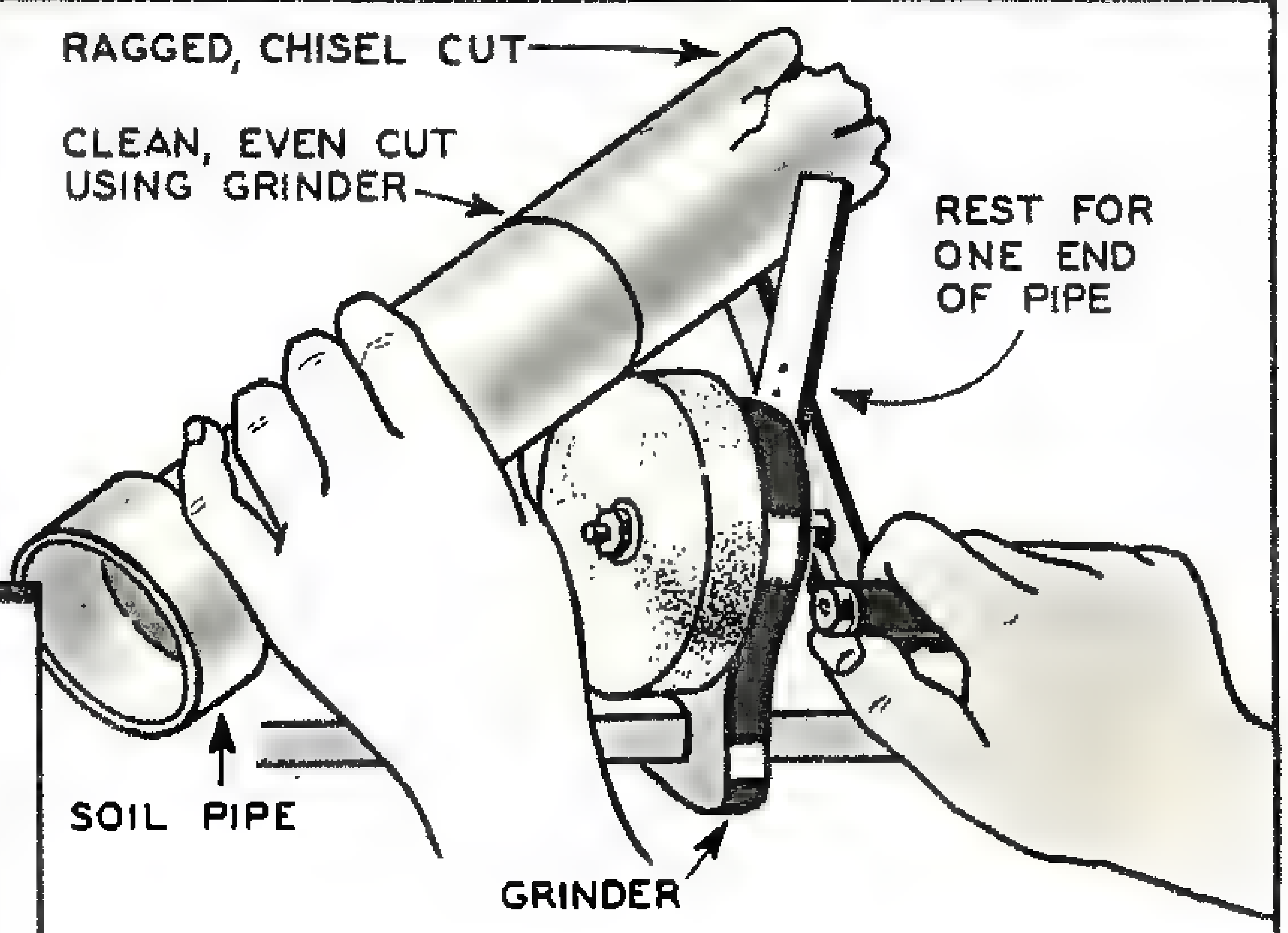
ICE cubes can be crushed into small pieces by placing the ice between two spoons and squeezing or pounding them as shown below. If the ends of the spoons are bolted or riveted together, the unit will be available permanently.


TWO TEA SPOONS RIVETED TOGETHER
ICE CUBES EASILY SLIPPED IN BETWEEN SPOONS AND...
CRUSHED BY HAND PRESSURE


SLIP COTTER PIN ON LARGE END OF PIPE
JOINTS ARE THEN MADE UP AND HOLD COTTER PIN
COTTER PIN
STOVE PIPE
JOINT
DEPENDABLE HANGER

Cotter Pins Hold Stove Pipe

WHEN a stove pipe, made up of several individual lengths, is hung from a ceiling, the usual method is to fasten it by wire wrapped around the pipe. If a cotter pin is slipped into each joint, and a piece of wire from the ceiling fastened to this, it will be found more convenient than the former method. The pipe then can be taken down quickly by slipping out the pin. The pin and wire can be left in place until the pipe is hung up again.


RAGGED, CHISEL CUT
CLEAN, EVEN CUT USING GRINDER
REST FOR ONE END OF PIPE
SOIL PIPE
GRINDER

Grinder Cuts Heavy Soil Pipe

A HAND-OPERATED grinder is an excellent tool for cutting tile or cast iron soil pipe. A rest should be placed at one end of the bench so that the pipe can be rotated with one hand while the other is used for turning the wheel. Hold the pipe against one edge of the wheel so that the resulting cut is in the shape of a "V." The grinder should be turned from the conventional position of having the wheel parallel to the edge of the bench, to one in which the wheel is nearly perpendicular to the edge.

The valve held in the hand is the ordinary air valve. The one fastened to the radiator is the vacuum type. Note its larger size.

Vacuum

EVERY home owner who is concerned about the cost of fuel (and what home owner isn't?) should investigate the possibilities of savings by vacuum valves. When installed in a heating system of the one-pipe steam type, which is the most popular type in small homes, these valves as a general rule bring about an appreciable reduction in the amount of coal or oil burned. They are considerably more expensive than ordinary air valves—they cost between $2.00 and $4.00 each as compared to 50 or 75 cents for air valves—but they must be looked upon as an investment that will repay itself in a short time. While of course fuel consumption is a matter of the individual house—the condition of the boiler, the exposure of the house, its insulation, weatherstripping around doors and windows, and other factors—the experience of heating contractors over a period of years definitely indicates that this cost will be returned to the purchaser in reduced fuel bills.

When heating men suggest vacuum valves to their customers, the latter always ask, "What's the difference between vacuum valves and ordinary ones?" The explanation is very simple.

In any steam heating system, water is heated in a boiler until it forms steam. This rises through the connected piping pushing the cold air in the pipes ahead of it. The function of the valves on the radiators is to let the cold air out. Once the radiators fill with steam and become hot, the valves are supposed to close. The live steam is thus imprisoned and gives up its heat to the fins of the radiators, which in turn heat the surrounding air in the room. As the fire dies down (in the case of a coal burner), or the burner goes off (as with an oil burner), the supply of steam in the pipes diminishes, and after it has given most of its heat to the iron radiator it cools off and condenses back into water, which runs back into the furnace. Meanwhile, the valves also cool off and soon their vents open, permitting air to re-enter the pipes. Cheap valves have a tendency to open too soon, and the air they admit hastens the cooling of the thin steam vapor and pushes it back into the pipes and to the furnace. This rapid cooling of the radiators is more noticeable with oil burners than with coal, as steam pressure is "up" only when the burner is in operation. During "off" periods the steam is practically dormant in the pipes and is easily affected by the pressure of the air that enters via the valves. In coal furnaces there is a fine smoldering all the time, and, depending on the adjustment of the draft, there is some slight steam pressure to counteract the air pressure. The latter nevertheless is undesirable.

Vacuum valves are designed to be truly "one-way" vents. When steam comes up the first time, it pushes the residual air through the pipes and out of the valves, as before, but this time the valves close and *remain closed.* The advantages of this reliable seal against air becomes obvious immediately. The steam remains in the pipes until it has given up all its energy to the iron radiators. When it finally condenses and becomes water again, returning to the furnace tubes, the space it formerly occupied becomes vacant. Since air cannot enter by way of the valves, the space stays empty—in other words a partial vacuum is formed there.

When steam comes up during the next cycle of burner operation, as controlled by a room thermostat or by hand adjustment of the dampers, it comes up much more

VALVES SAVE FUEL

quickly than before, for two reasons: 1—There is no air resistance for it to overcome; 2—Steam forms much more readily in the absence of atmospheric pressure on the surface of the water being heated in the boiler. In practical terms, this means that the burner works for a shorter period and uses less fuel to produce a given amount of "steam heat" than if air were present. The fact that the steam stays in the pipes longer and comes up more quickly when needed means that a more uniform temperature will be maintained in the house, especially with oil burners. With ordinary valves, radiators cool more quickly, and by the time the burner has again responded to the room thermostat the house is chilly.

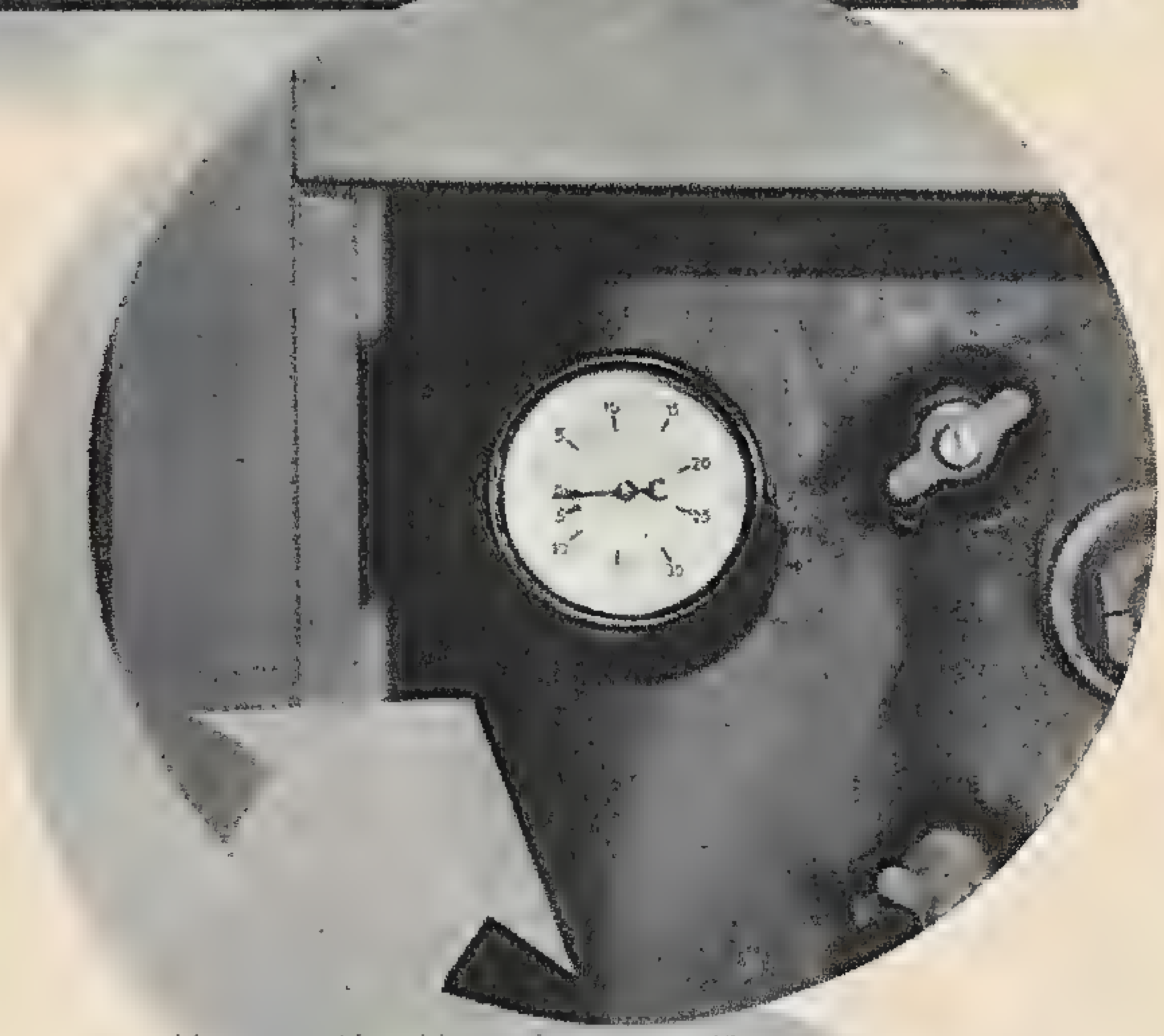
It is evident that the entire piping system must be completely air tight if the vacuum valves are to do their work properly. Many persons overlook this point and then complain bitterly after finding that the vacuum valves haven't increased home comfort a bit. Fortunately, the job of "vacuumizing" a one-pipe system is very simple and is easily done by any home owner who is handy with tools.

The first step is to clean the boiler thoroughly with a good cleaning compound, following the instructions on the can. After draining the tubes and refilling with fresh water, fire the boiler or turn up the room thermostat to 80 degrees or so to build up several pounds of pressure of steam. Inspect all radiators and fiittings and listen for signs of escaping steam. It is a good idea to repack the hand valves on the radiators whether they appear to need it or not. A 25-cent can of graphited asbestos metallic packing and a wrench from the car will do the trick. The boiler glass gauge is usually a leaky element and it too should be repacked. A few cents will buy all the rubber washers needed for the purpose. Be sure to turn off the cutoff cocks leading to the gauge before loosening the retaining nuts, otherwise you will get a bath of hot water from the boiler.

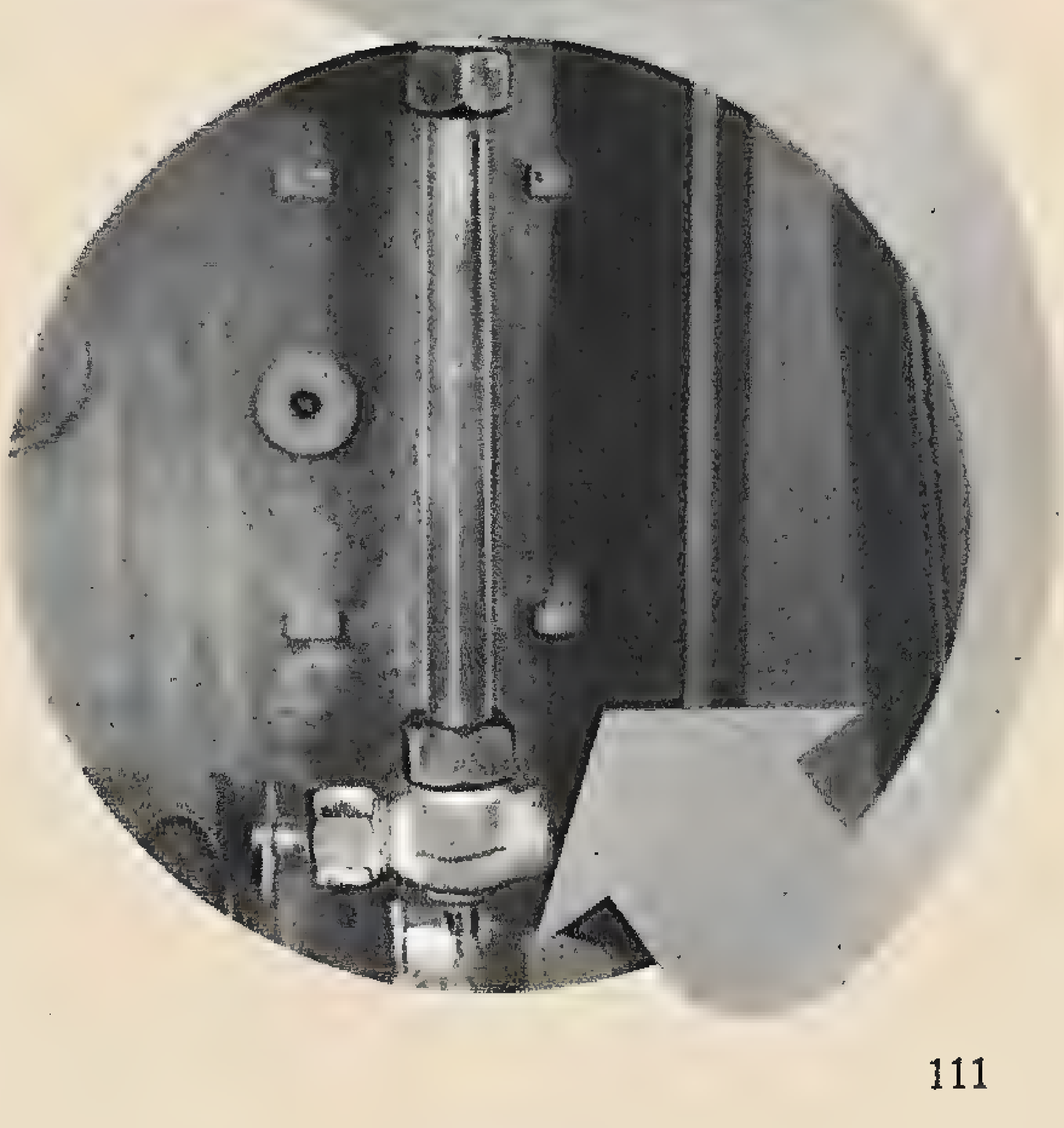
If the present pressure gauge on the furnace reads merely in pounds from 0 to 30, it must be replaced by a compound gauge, which reads pressure in pounds on one side and inches of vacuum on the other.

Remove the old air valves from the radiators and replace them by vacuum valves. Start the latter in the radiators and after about three turns coat the stem with white lead or any pipe sealing compound. Then complete the job by tightening the valves in an upright position.

[*Continued on page* 112]

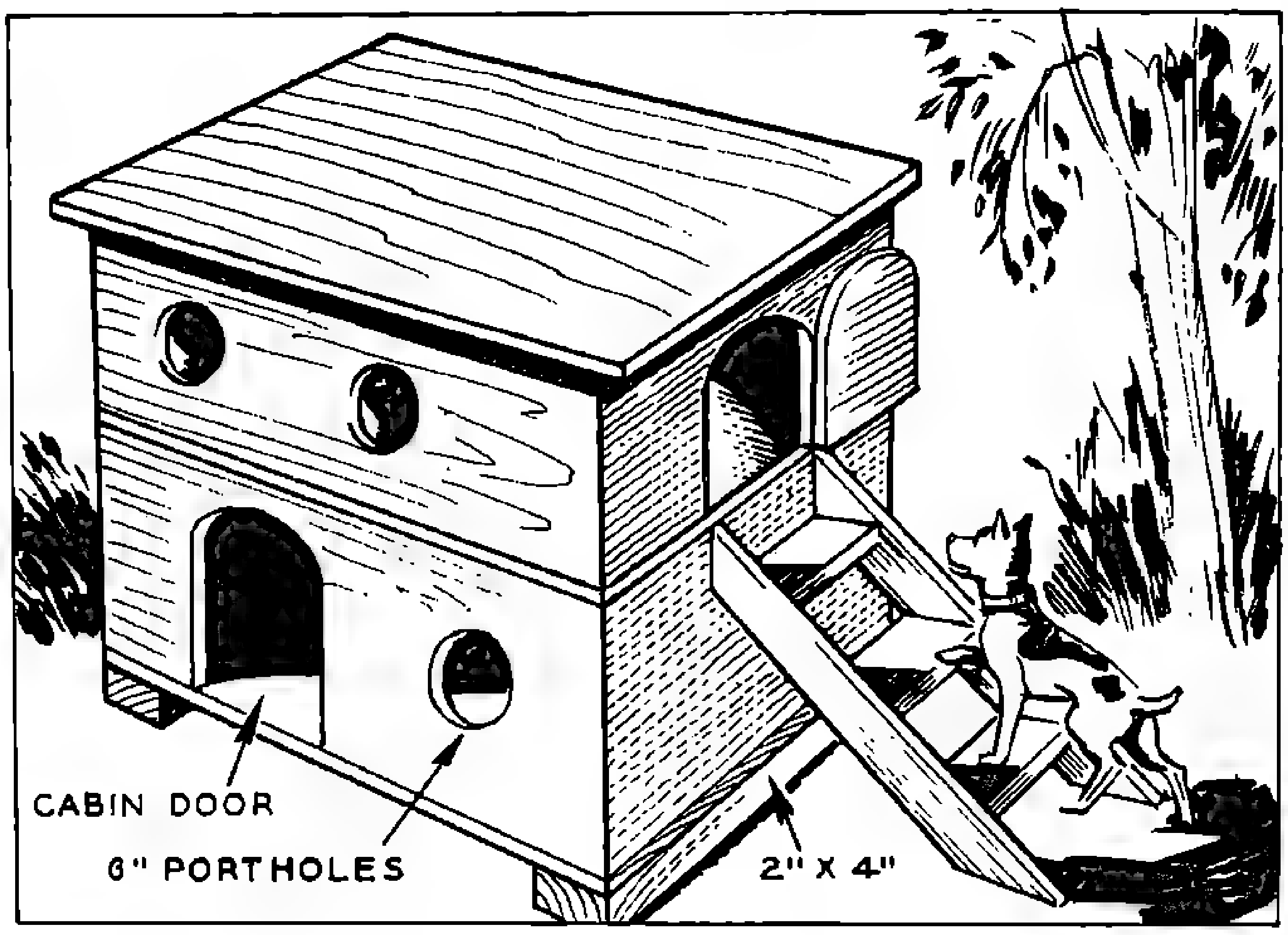


Above—This is type of double reading gauge which should be used with vacuumized heating system. Below—Water gauge fittings should be repacked to eliminate possibility of air leaks.



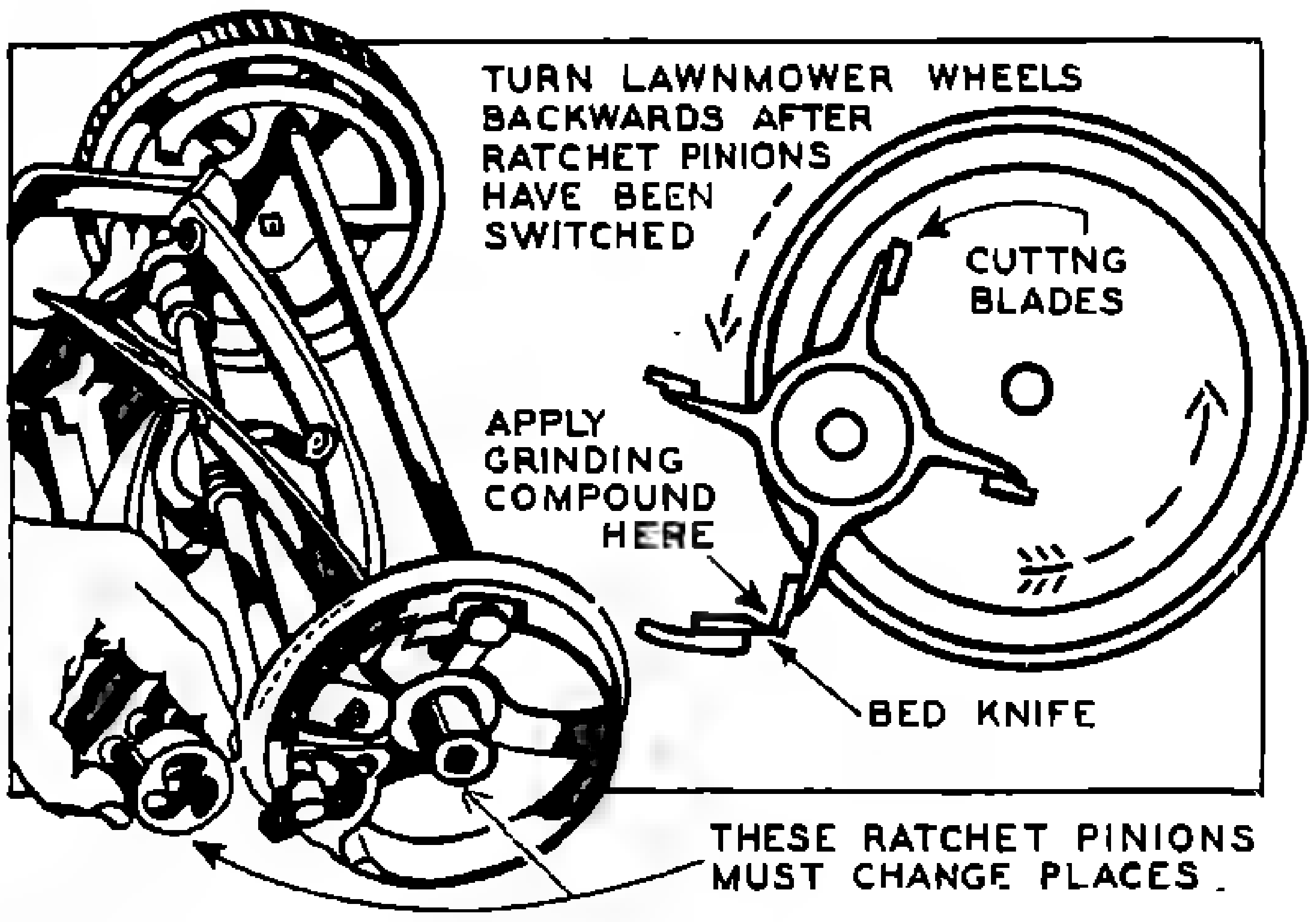
"Staterooms" Provide Accommodations For Dogs

FIRST class accommodations for dogs will be provided by this neat little stateroom cabin. The size of the compartments will depend on the size of the animals to be housed. Two medium size packing boxes form the rooms. They should be nailed together, with a wide board fastened across the top to provide a roof. Both upper and lower rooms should have arched doorways and one or two port holes. Make a ladder from narrow boards, and fasten the upper end just under the top door. If the dogs are to be kept inside for any length of time doors should be fitted to the openings.



Reversing Lawnmower Direction Sharpens Blades

BY TAKING off the wheels of a lawnmower and changing the positions of the left ratchet pinion to the right side and the right one to the left side, the cutting blades will turn backwards. When the pinions are changed, the sliding dogs also should be changed. Apply grinding compound to the blades and the bed knife. When turning, the blades will be ground accurately with a good cutting edge their entire length. In most cases, lawnmowers will not require sharpening more than once or twice a season. When more frequent sharpening is necessary, this method will be particularly valuable.


TURN LAWNMOWER WHEELS BACKWARDS AFTER RATCHET PINIONS HAVE BEEN SWITCHED
CUTTNG BLADES
APPLY GRINDING COMPOUND HERE
BED KNIFE
THESE RATCHET PINIONS MUST CHANGE PLACES

Vacuum Valves Save Fuel

[*Continued from page* 111]

Each return line of the radiator piping system (there are only two in most small houses) must be equipped with a straight shank vacuum valve. The most difficult part of this operation is removing the plug in the top of the vertical return pipe, which carries the condensed steam back to the furnace. This involves the use of a large wrench and plenty of muscle.

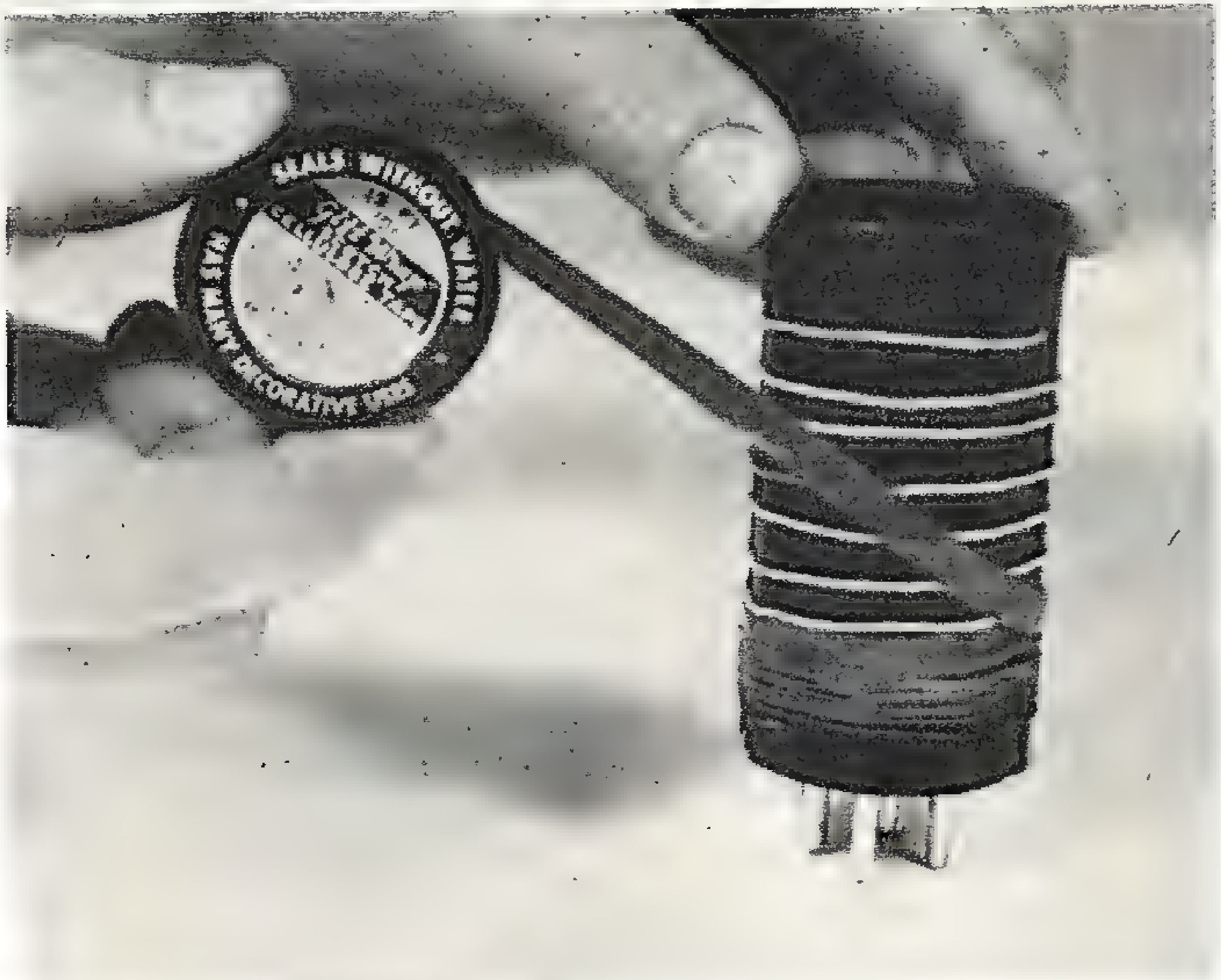
The "vacuumized" system is ready for immediate use. Get up steam, a little more than needed for comfort, and then cool the hot radiators quickly by opening a few windows. Then watch the pressure gauge. If everything is tight the needle will start backwards after a few minutes. A vacuum of fifteen inches represents a properly working system, but the real test is the length of time the vacuum holds. If there are any leaks in the pipes, the needle will drop.

A good way to find air leaks around pipe joints or hand valves is to hold a lighted match near them. A leak will show up by the flame being blown *toward* the opening by the rush of room air into the pipes.

Vacuum valves are available in both fixed and adjustable models. The latter are particularly helpful in houses with unevenly distributed radiators. The valves on the radiators near the furnace are turned down to vent slowly, while the far valves are opened wide to vent quickly. In this way the far radiators have a chance to heat up before the close ones do when the latter overheat.

Radio Uses For Scotch Tape

ABOVE — Plain white pilot lights can be changed to the colored type by use of a small quantity of colored Cellophane and Scotch tape. The colored Cellophane should be fastened to a slightly wider strip of clear tape. Then wrap the two strips around the pilot bulb with the edges of the Scotch tape holding them in place. Above right—In some radio receivers, the pilot bulb becomes loose in the socket as the result of vibration from the speaker. This problem can be solved by wrapping the bulb and socket with a piece of Scotch tape.



ABOVE — Colored tape wrapped around plug-in coils serves two useful purposes—holding the windings in place and identifying the frequency band of the coil. Each coil should be marked with a different color. Left —Small strips of colored tape can be used to good advantage as code markers for a group of wires, such as a battery or power supply cable. Each wire should be given a separate color or combination of colors.

a handsome "Prop" Clock

For Den and Mantle

by Ralph T. Moore

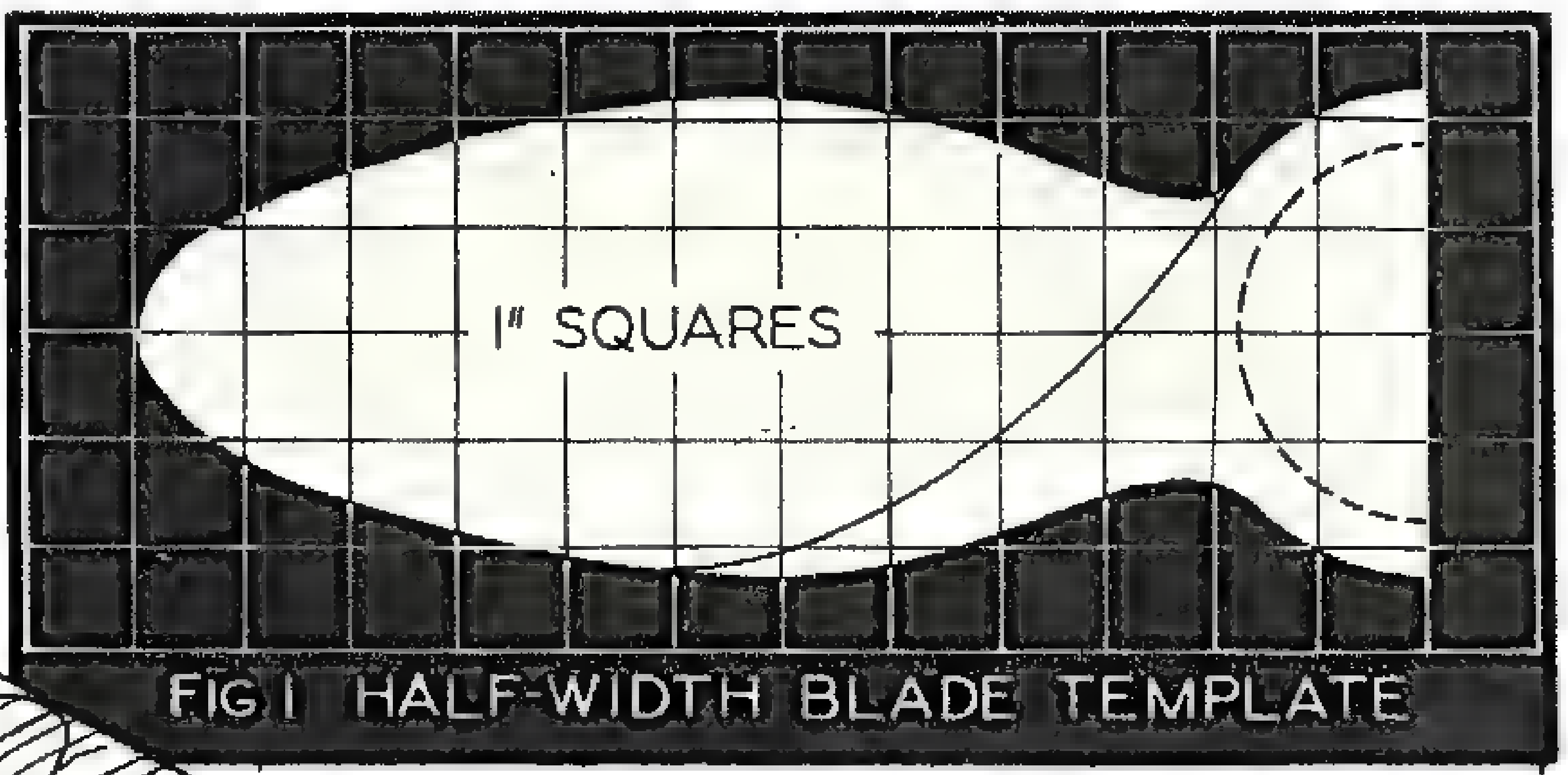
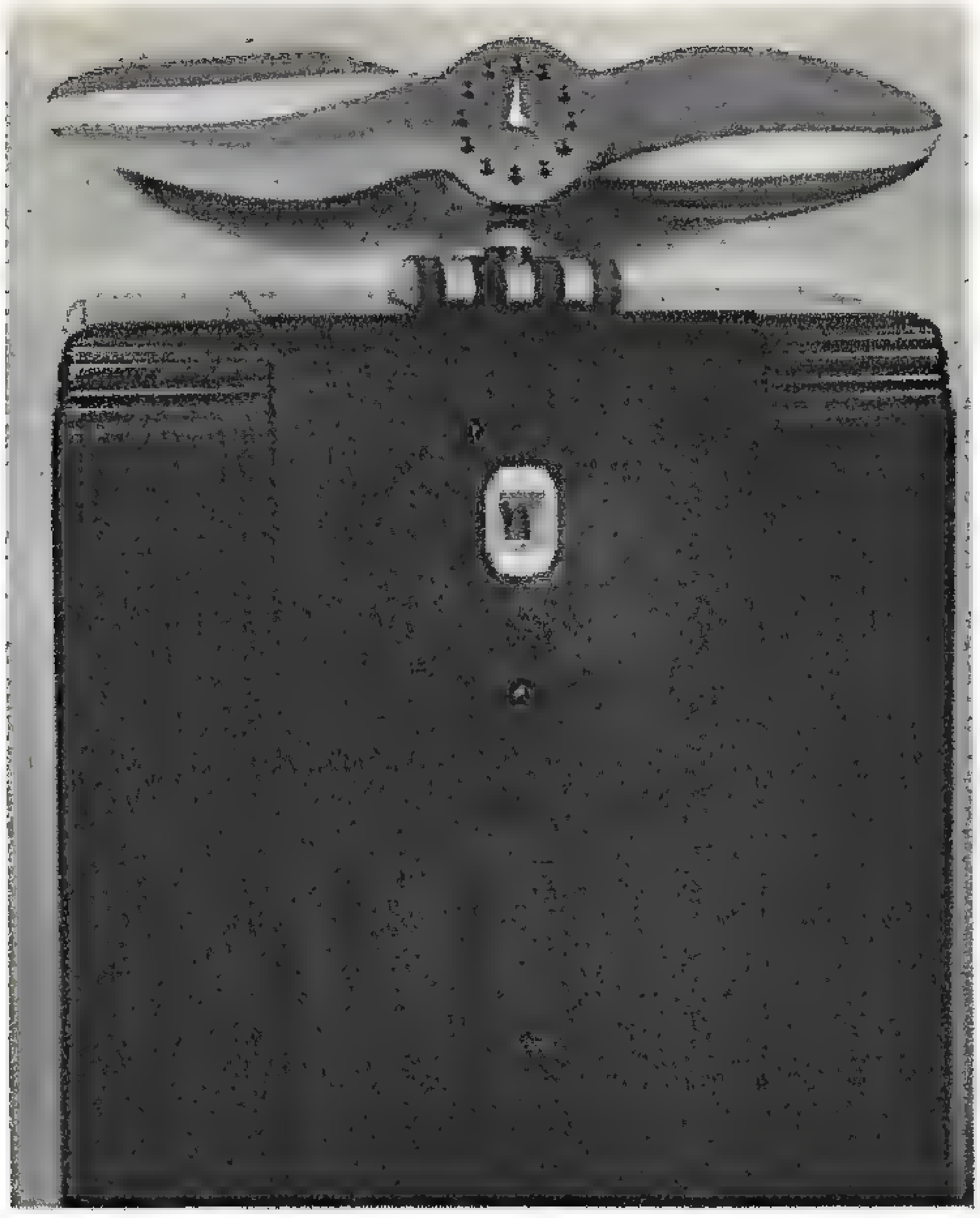


FIG 1 HALF-WIDTH BLADE TEMPLATE

THE handsome wooden propellers of a day just past in aviation history have always made attractive decorative pieces and have been suggestive of highly romantic exploits. This is no less true of the propeller clock here illustrated and its size renders it a bit more adaptable as an ornament than a full size "sky churner." The construction of this piece is in no way difficult and anyone who has ever whittled out a small propeller will have no trouble making it. The only requisite is the patience to sand the finished article and then sand some more.

The propeller shown is of laminated construction and the beauty of the woods selected will determine the beauty of the finished piece.



The completed prop clock standing on a radio in the living room. Note that the wood used is in two colors, adding to the attractiveness of the finished product.

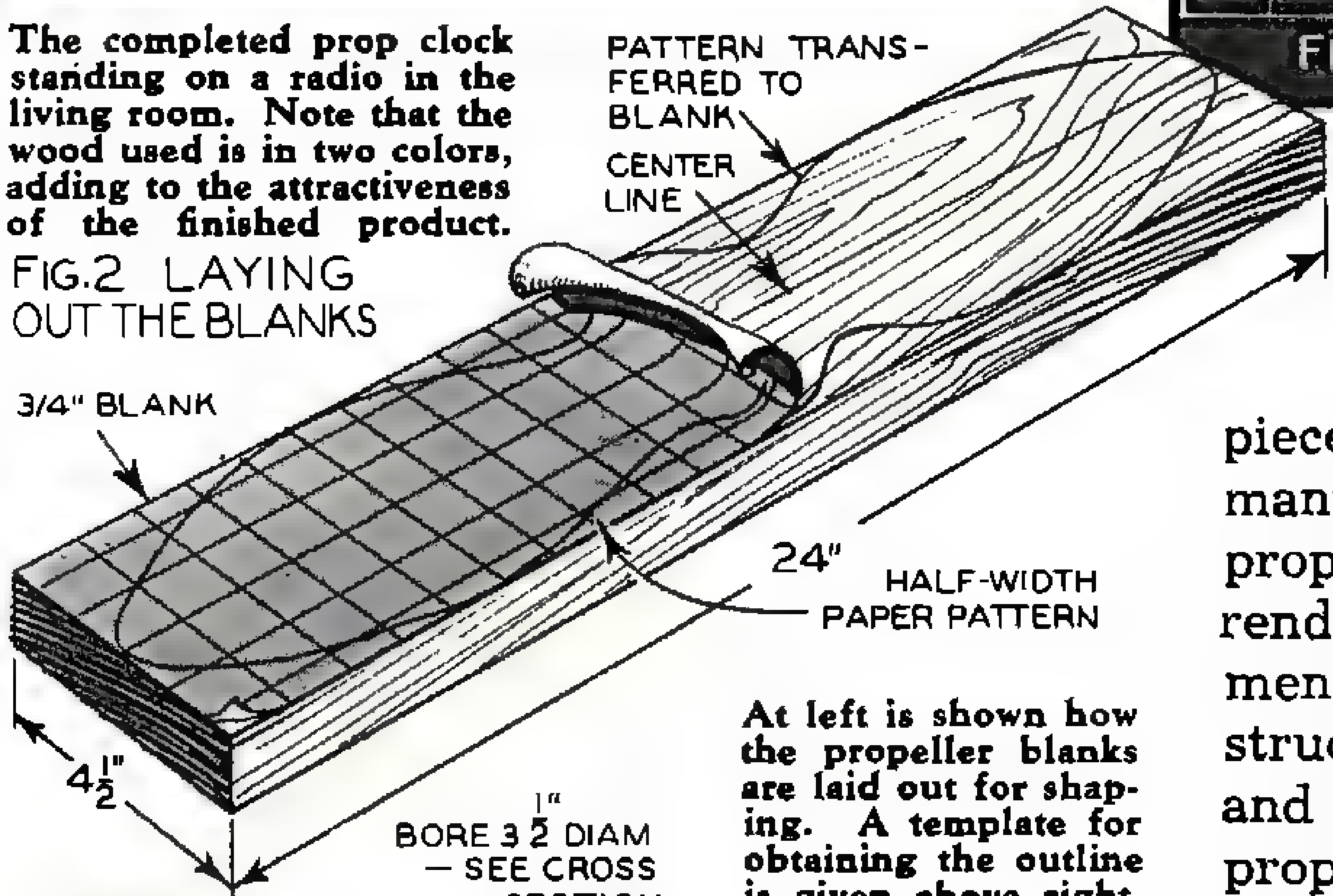

PATTERN TRANSFERRED TO BLANK
CENTER LINE
3/4" BLANK
24"
HALF-WIDTH PAPER PATTERN
4½"
BORE 3½" DIAM — SEE CROSS-SECTION

FIG. 2 LAYING OUT THE BLANKS

At left is shown how the propeller blanks are laid out for shaping. A template for obtaining the outline is given above right.

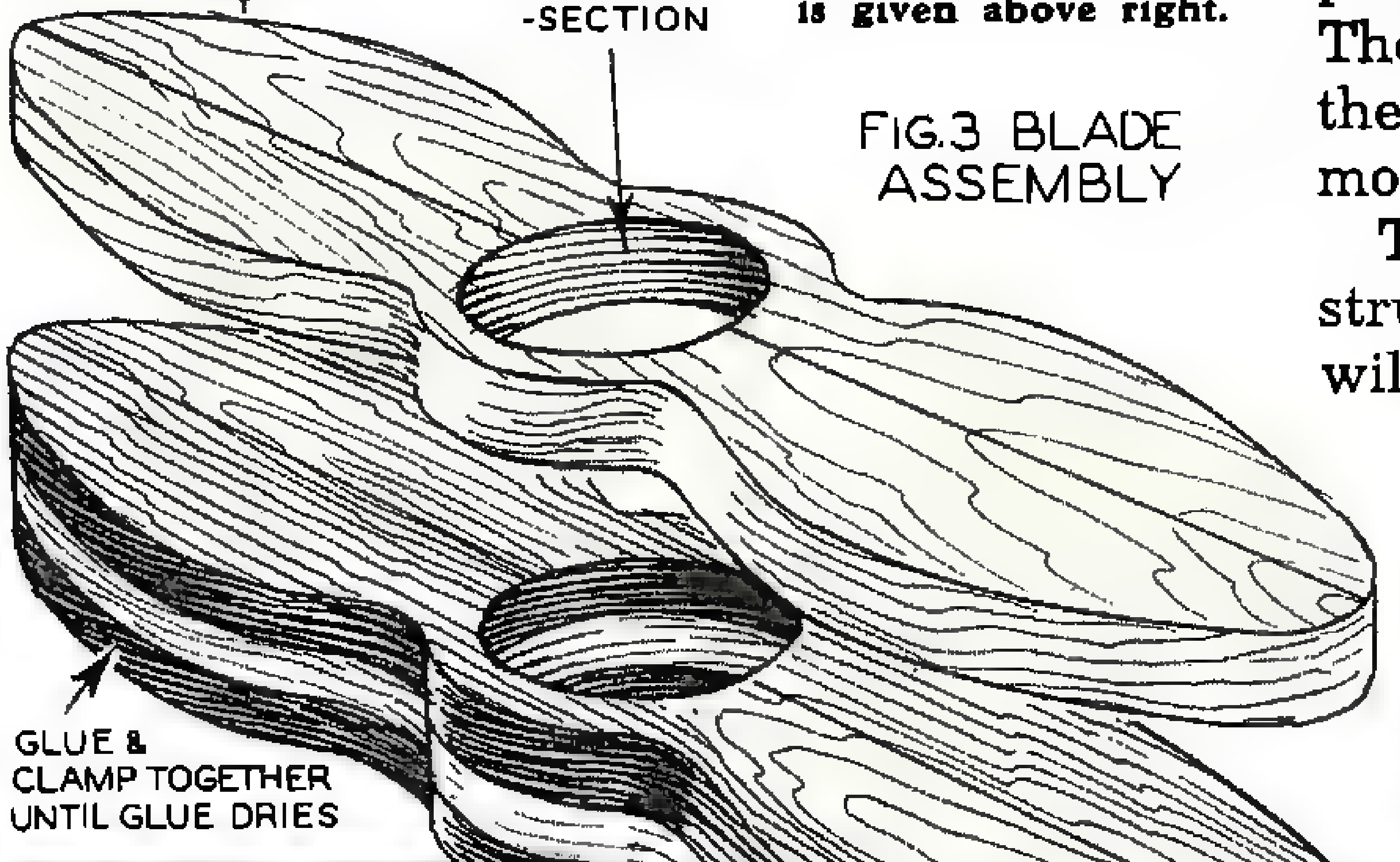

GLUE & CLAMP TOGETHER UNTIL GLUE DRIES
FRONT LAMINATION

FIG. 3 BLADE ASSEMBLY

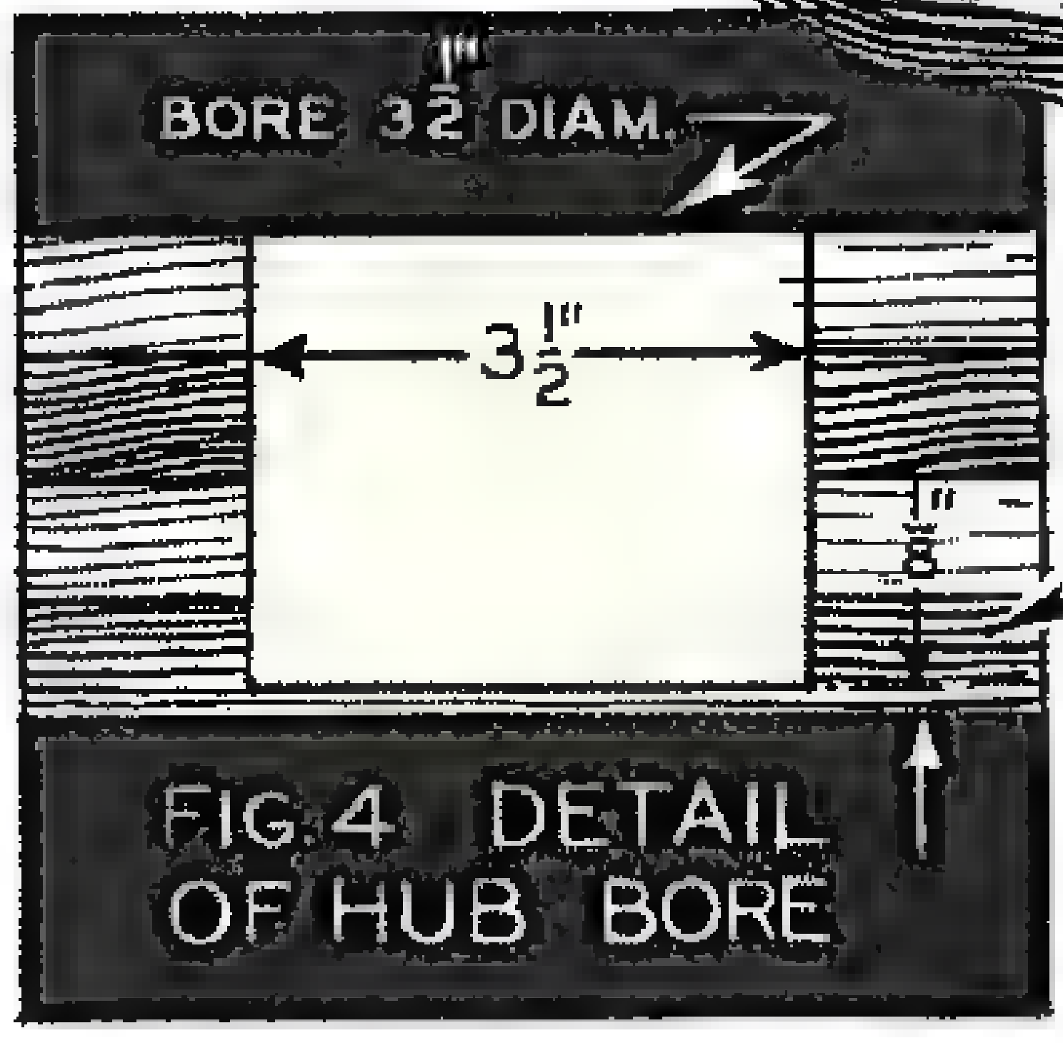
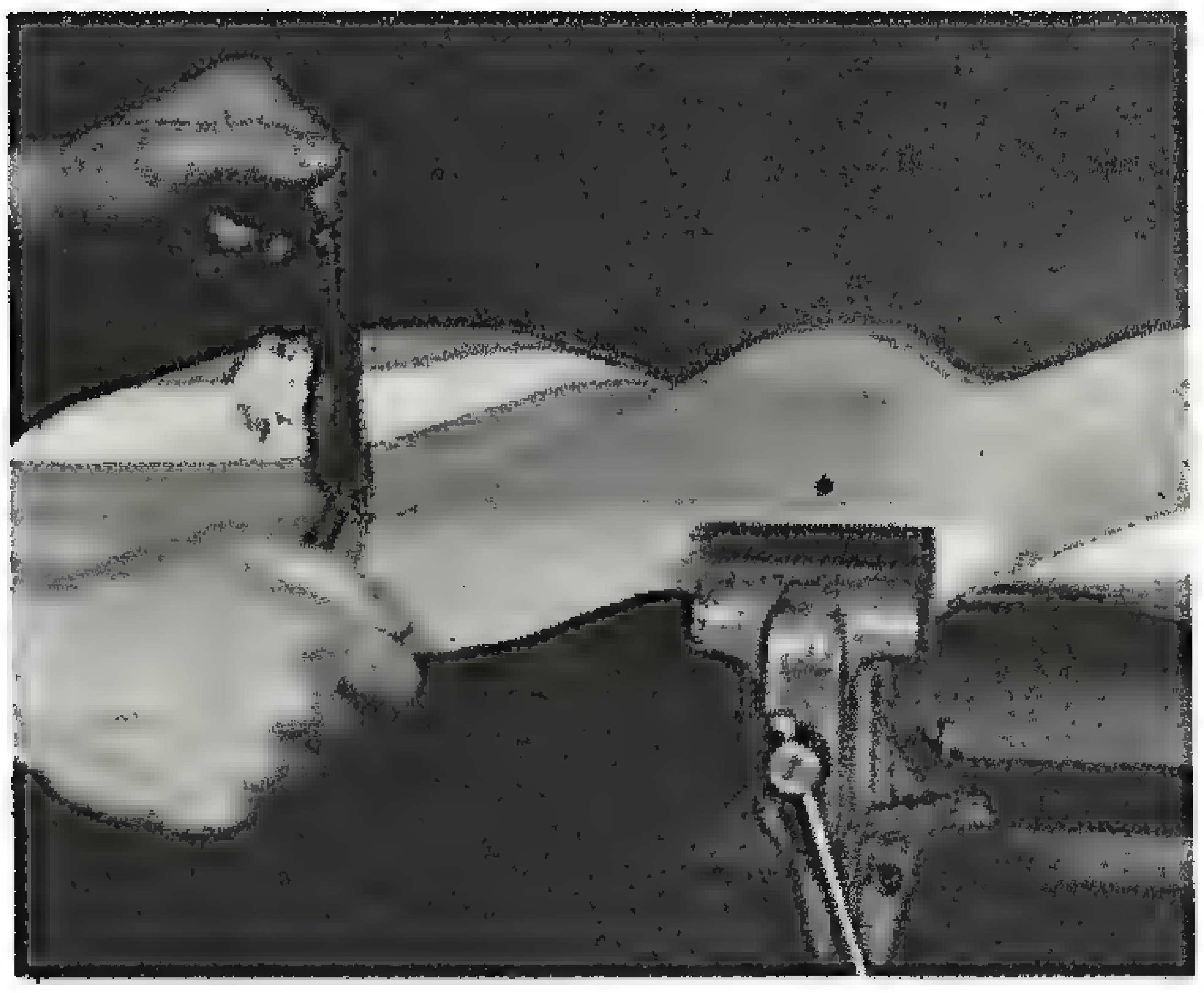
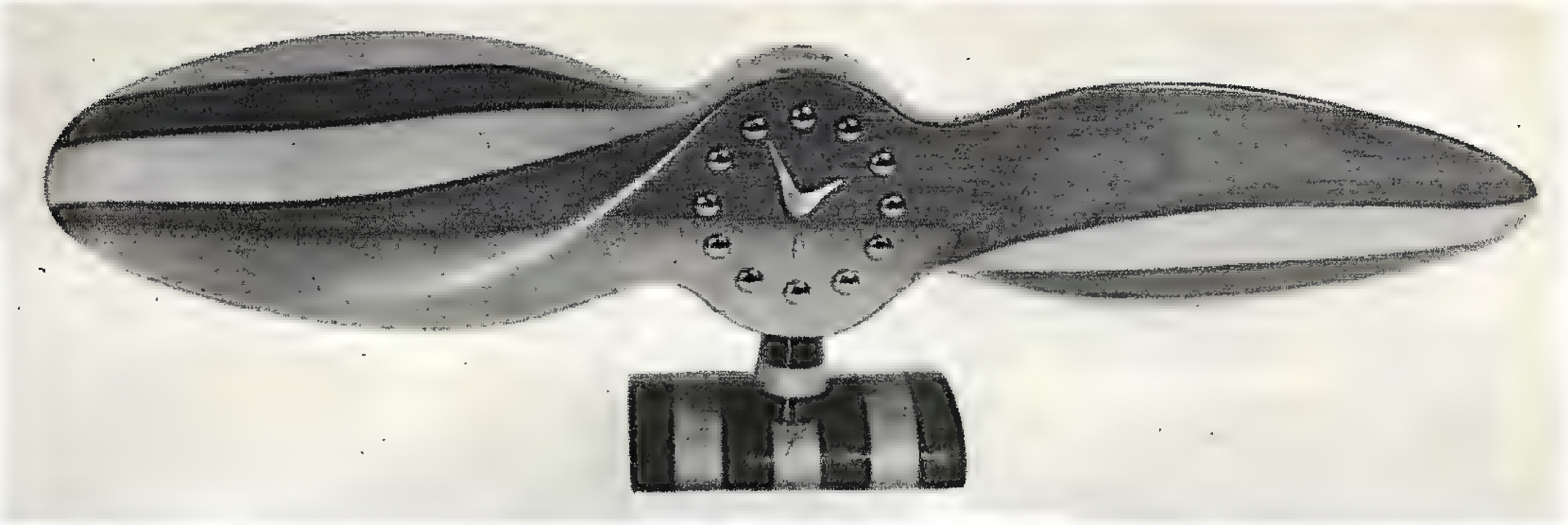

BORE 3½" DIAM.
3½"
1/8"

FIG. 4 DETAIL OF HUB BORE

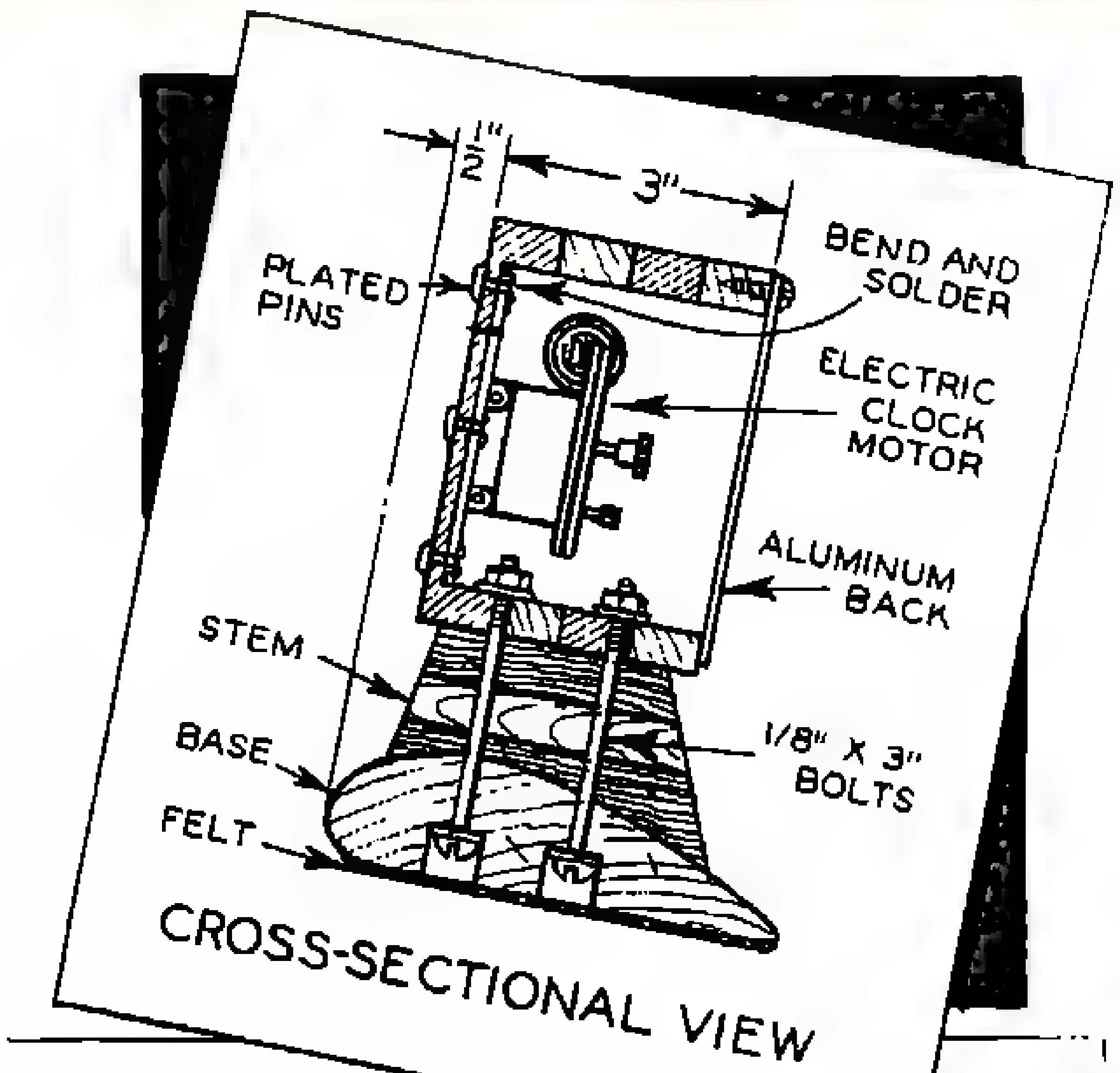
The propeller is made up of four layers of wood. The colors should be alternated, the darker being placed on the front. Right—Fig. 5. A drawknife is used for cutting the blades to the correct pitch.





Of course a dark wood and a lighter one are selected and it is suggested that red gum or mahogany is used for the dark wood and spruce or Michigan white pine be used for the light. After the wood has been selected, two pieces of each color 4½″ wide ¾″ thick and 2′ long are laid out from the pattern shown in Fig. 1. The half pattern is used to insure accurate marking. These are then sawed out on a band or jigsaw and the center is sawed or bored out with an expansion bit to a diameter of 3½″. This is done on three only, as the front or face piece is not bored through but is bored to allow ⅛″ of material at the front as shown in Fig. 4. This will of course have to be done carefully, drilling until the worm just breaks through. Then remove the material between

[Continued on page 134]


1/2"
3"
BEND AND SOLDER
PLATED PINS
ELECTRIC CLOCK MOTOR
ALUMINUM BACK
STEM
BASE
FELT
1/8" X 3" BOLTS

CROSS-SECTIONAL VIEW

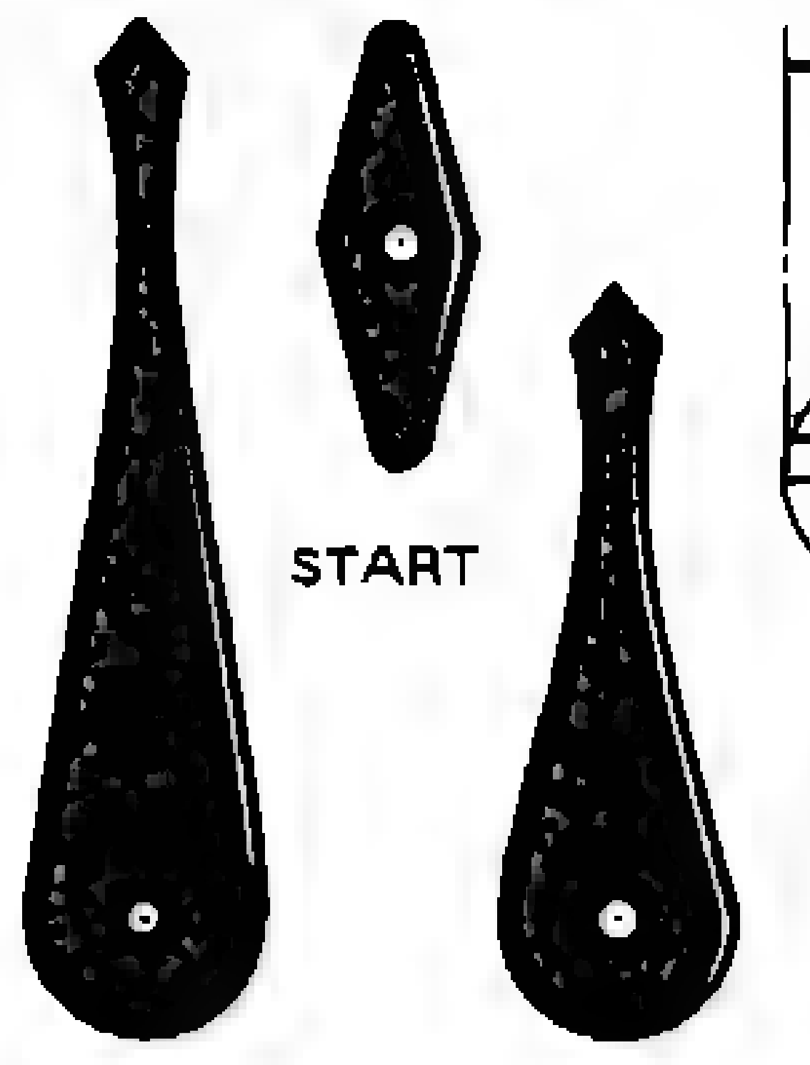

START
MINUTE
HOUR

FIG. 8 FULL-SIZE HAND PATTERN

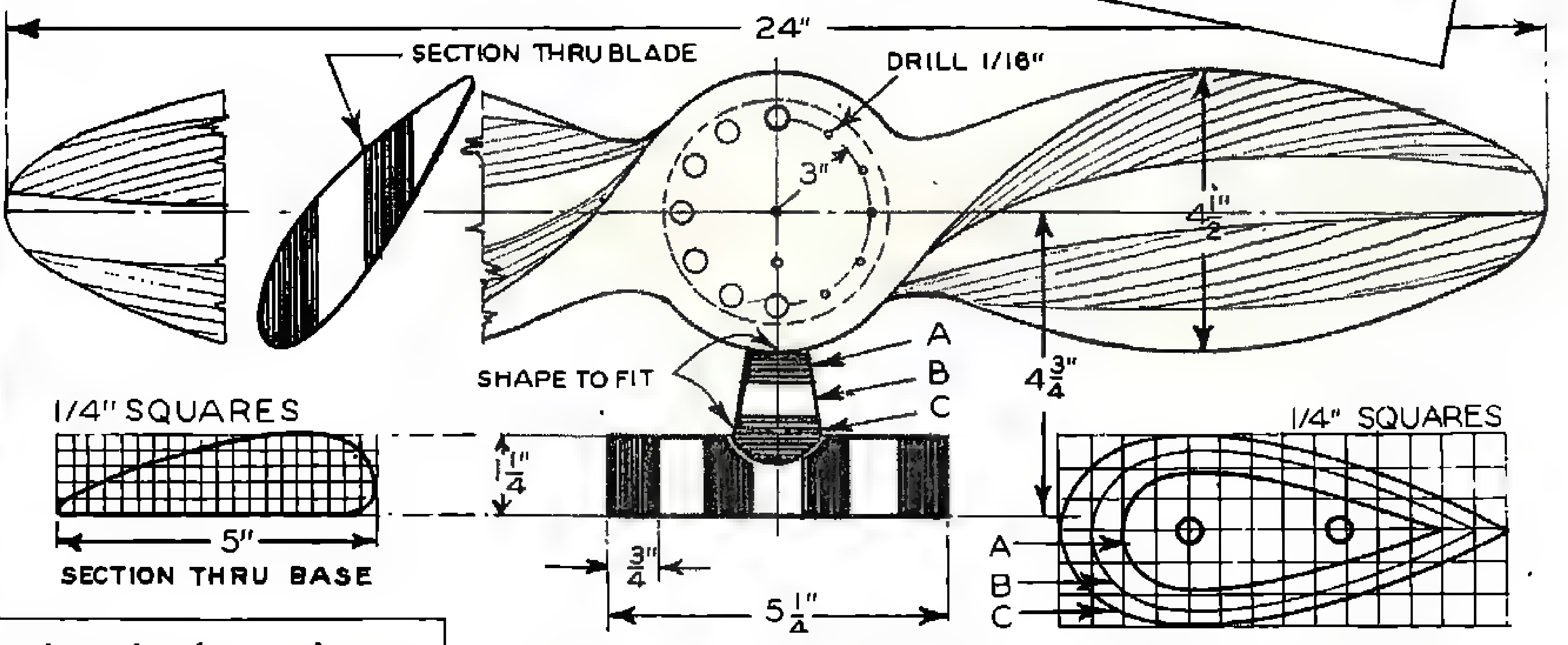
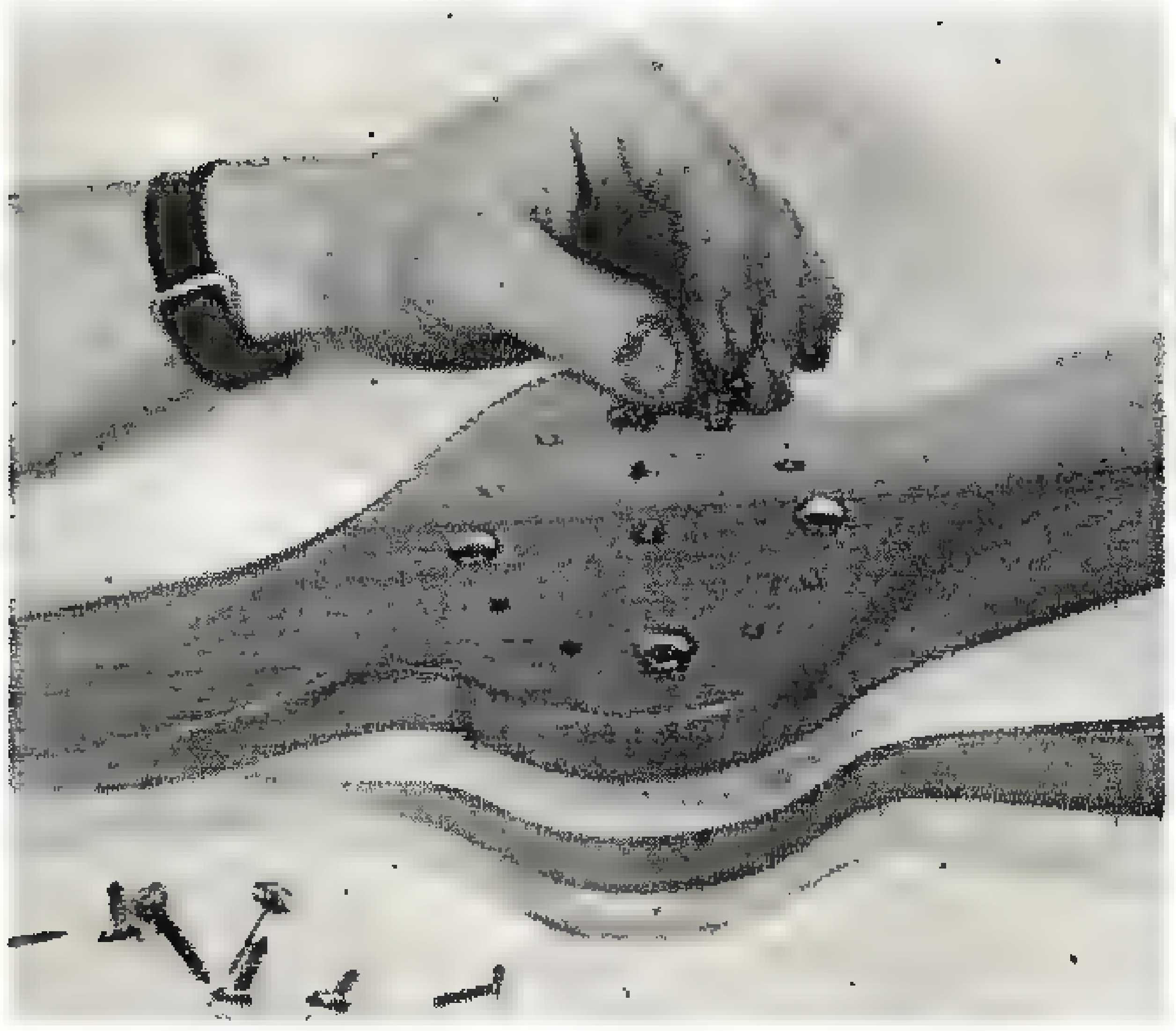
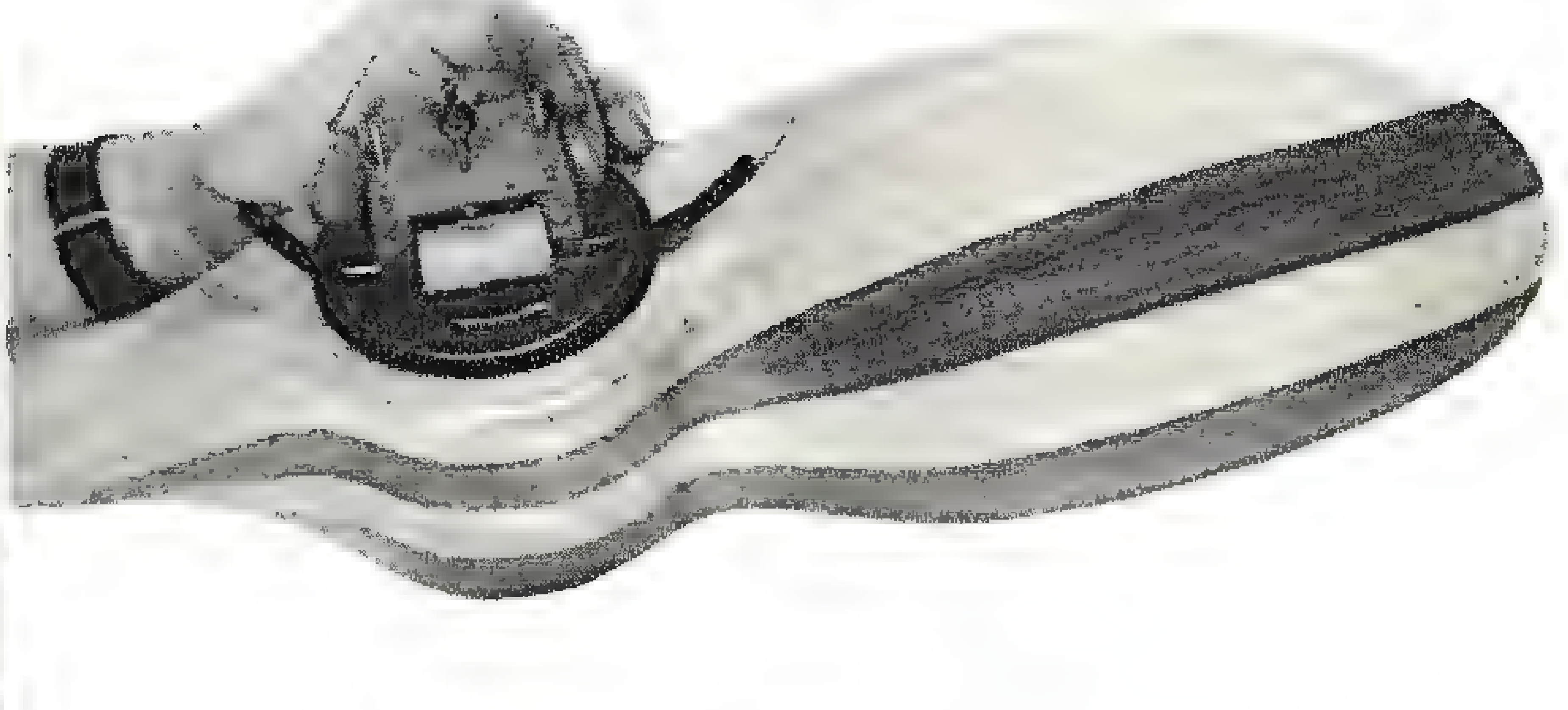

24"
SECTION THRU BLADE
DRILL 1/16"
3"
4 1/2"
SHAPE TO FIT
A
B
C
4 3/4"
1/4" SQUARES
1 1/4"
5"
SECTION THRU BASE
3/4"
5 1/4"
1/4" SQUARES
A
B
C
SECTION THRU STEM PIECES

FIG. 7 GENERAL ASSEMBLY

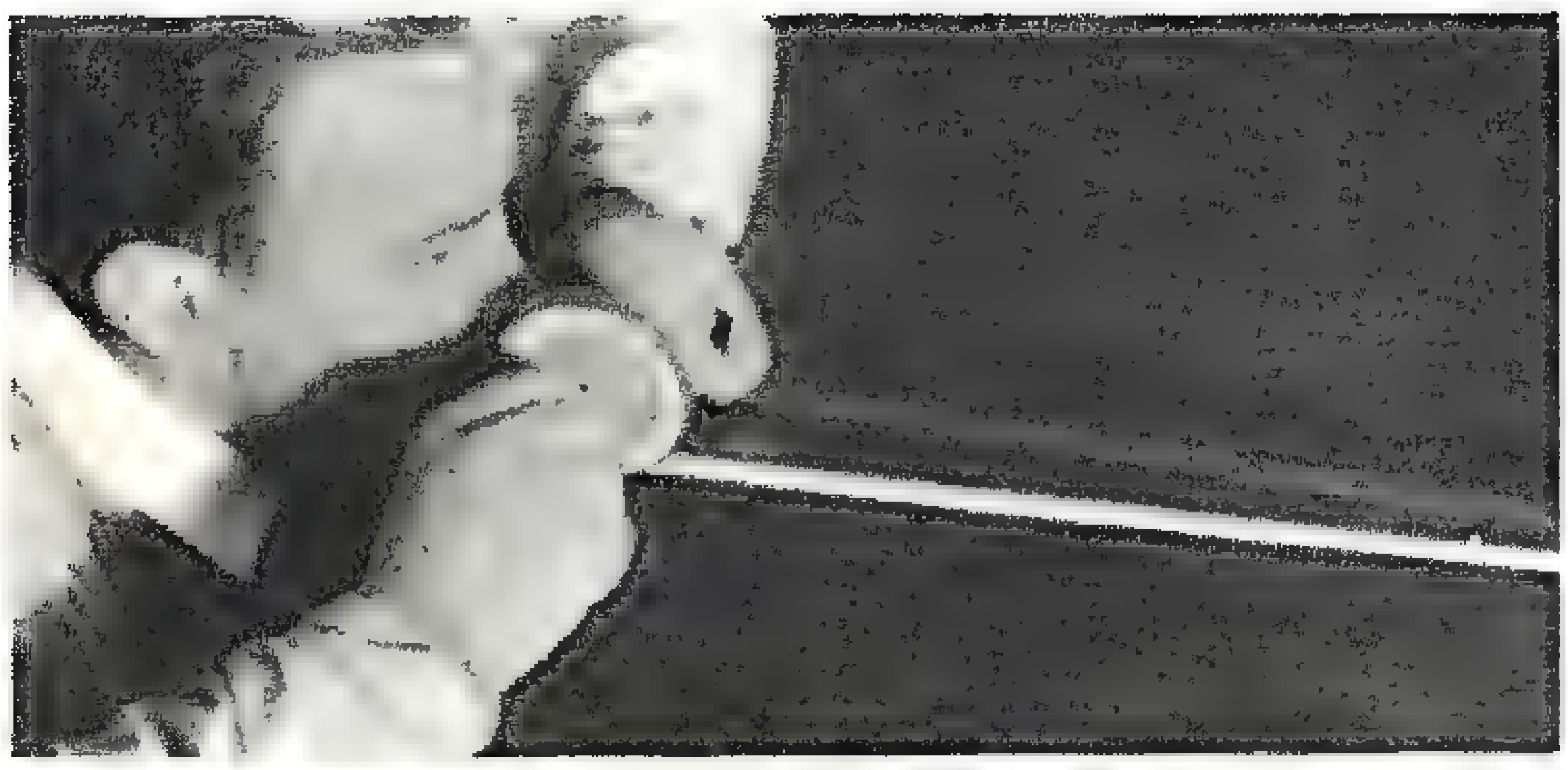
Fig. 6, below. Four chromium plated paper fasteners are used to hold the motor in place. The other eight take their positions around the circle in place of the conventional clock numerals.

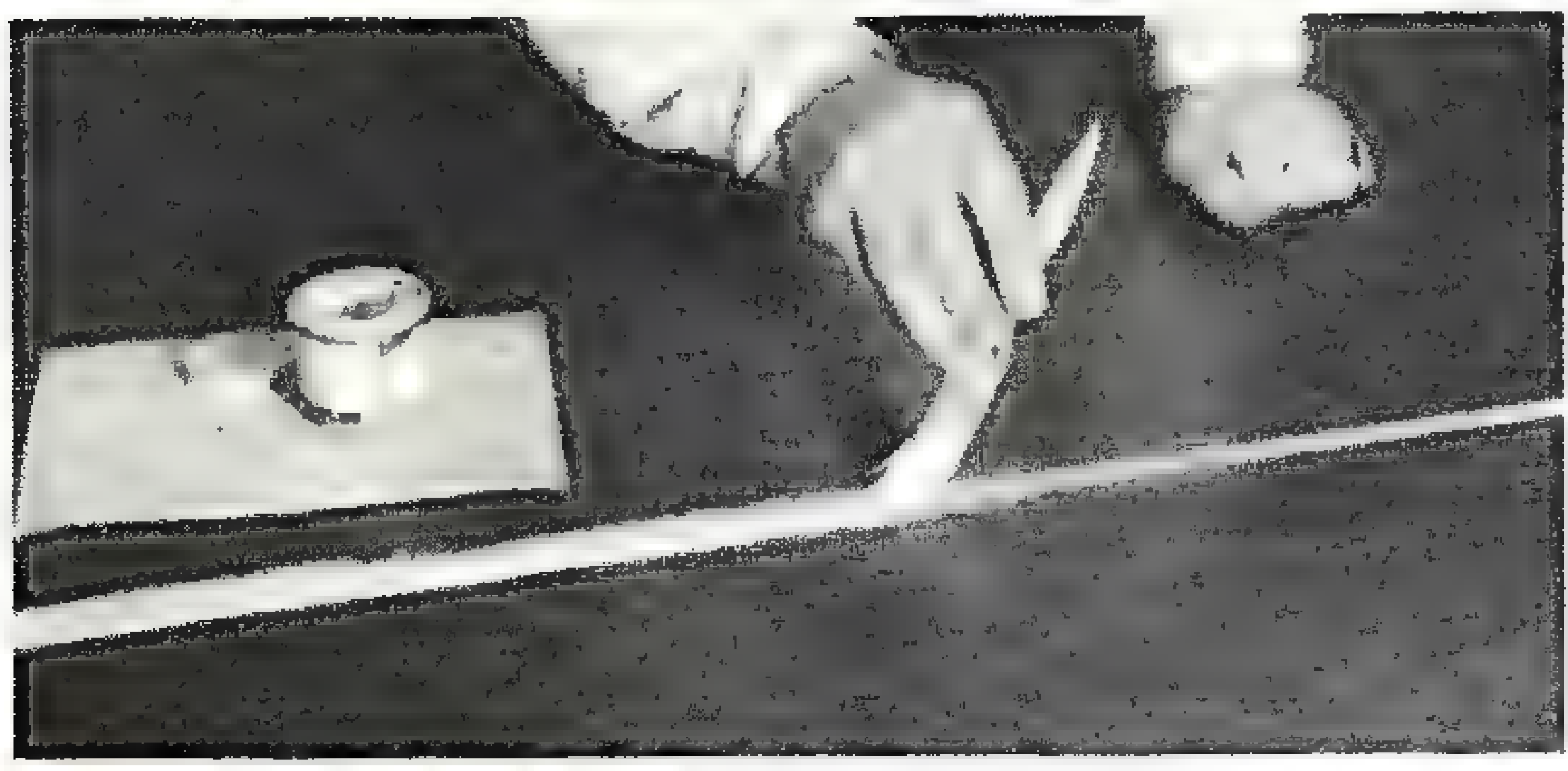


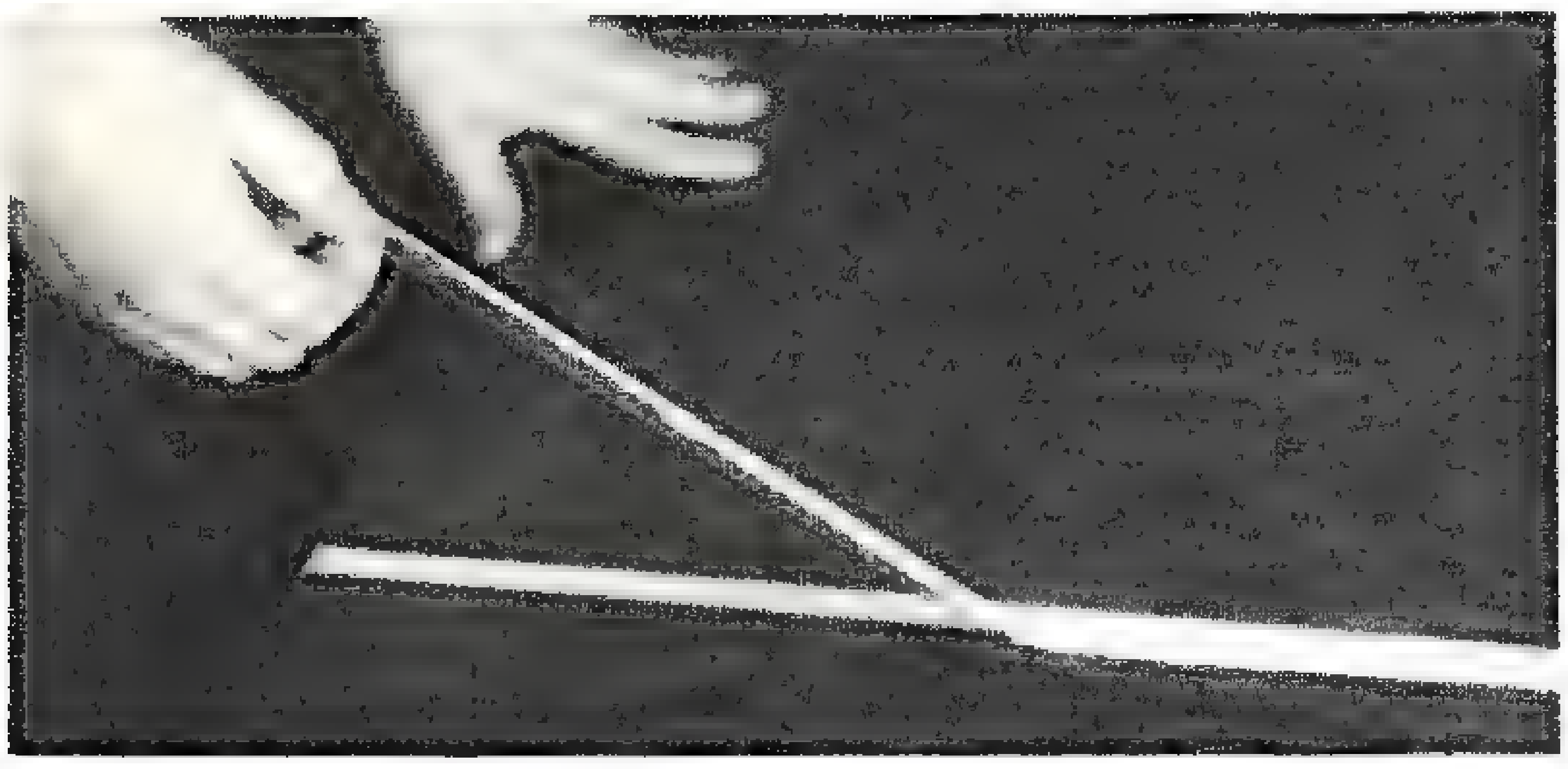
Below—The motor to be installed in position in the hub.

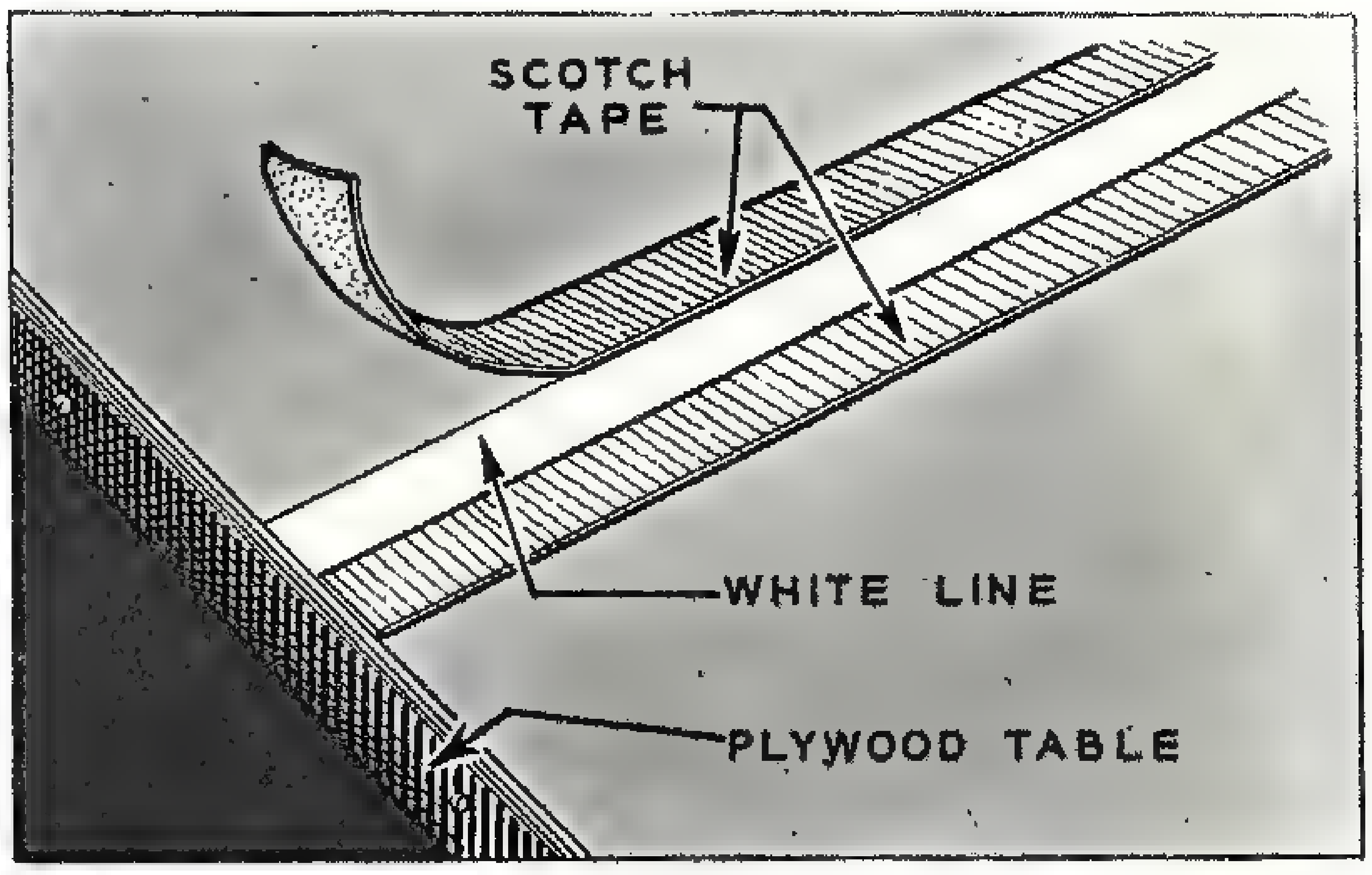


STRIPING TABLE TENNIS COURT








SCOTCH TAPE
WHITE LINE
PLYWOOD TABLE

WHEN white stripes are to be painted on a table tennis court, this novel method can be used to good advantage to obtain straight lines having a sharp edge.

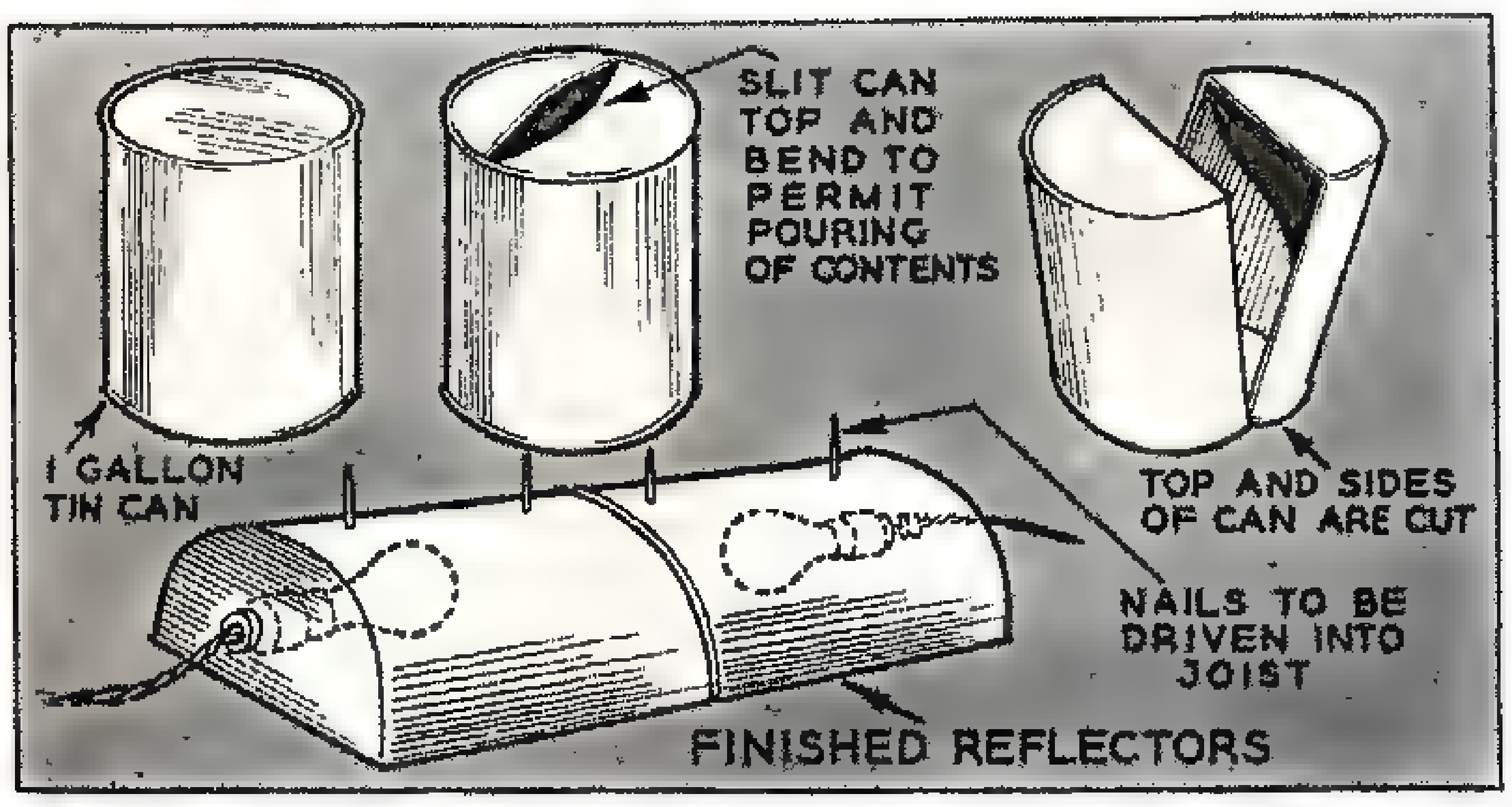
A board is placed on edge down the exact center of the table and then Scotch tape laid tightly on the table both sides of the board. Then tape is placed on each side of a board standing on edge crossways of the table.

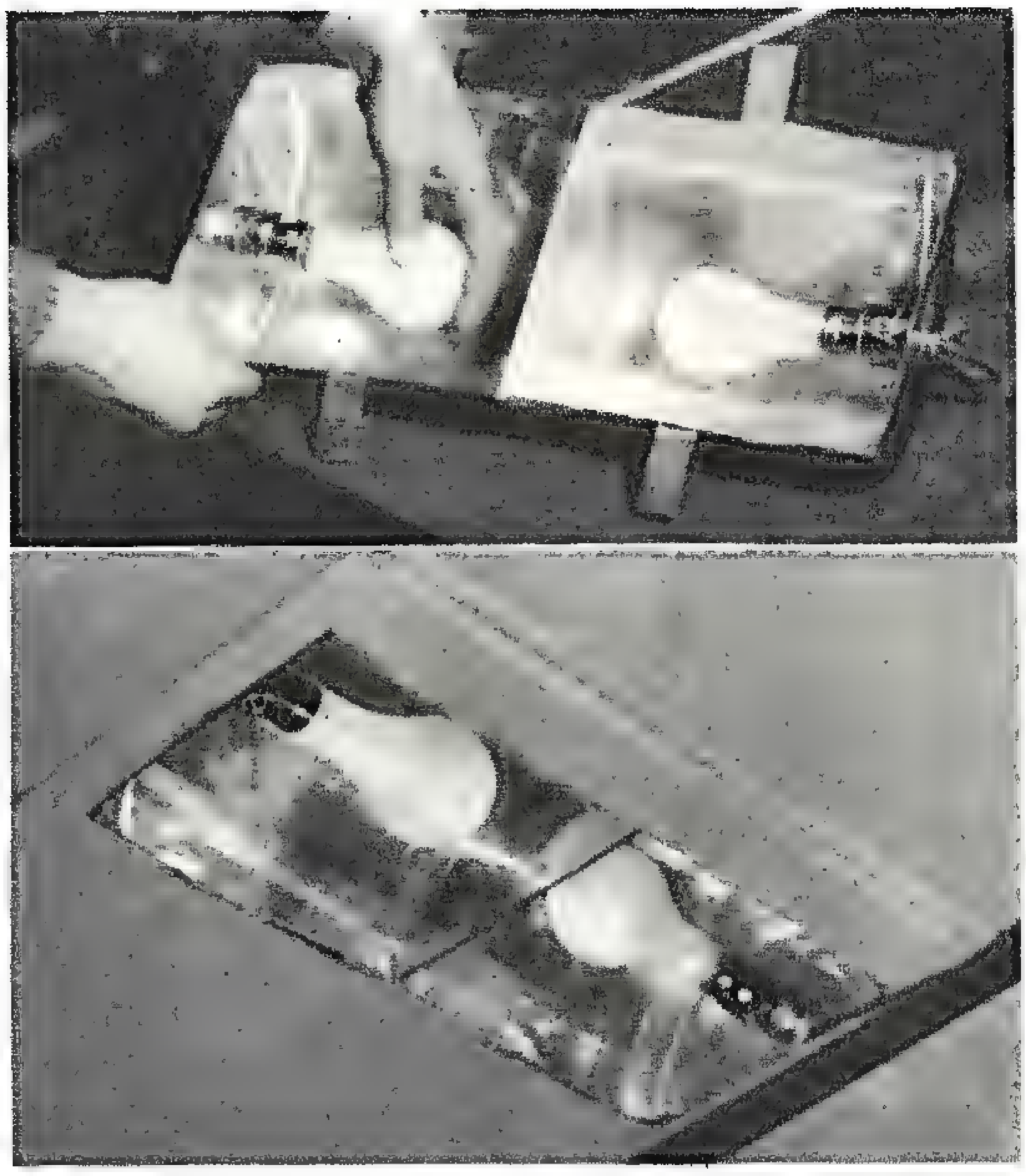
A single 1-inch brush, fairly heavily charged with paint, is merely wiped along this line, the edges of the paint lapping over on the tape. When the paint is dry the tape can be peeled off, leaving lines neat and uniform.

Twin-Light Reflectors For Cellar Game Table

EXCELLENT twin reflectors were made for lighting a table tennis court by using a gallon tin can in which sauce had been packed. The top was slit across the middle, and one-half depressed enough to permit pouring out the contents. Then this cut was continued down opposite sides and the bottom halves bent face to face.

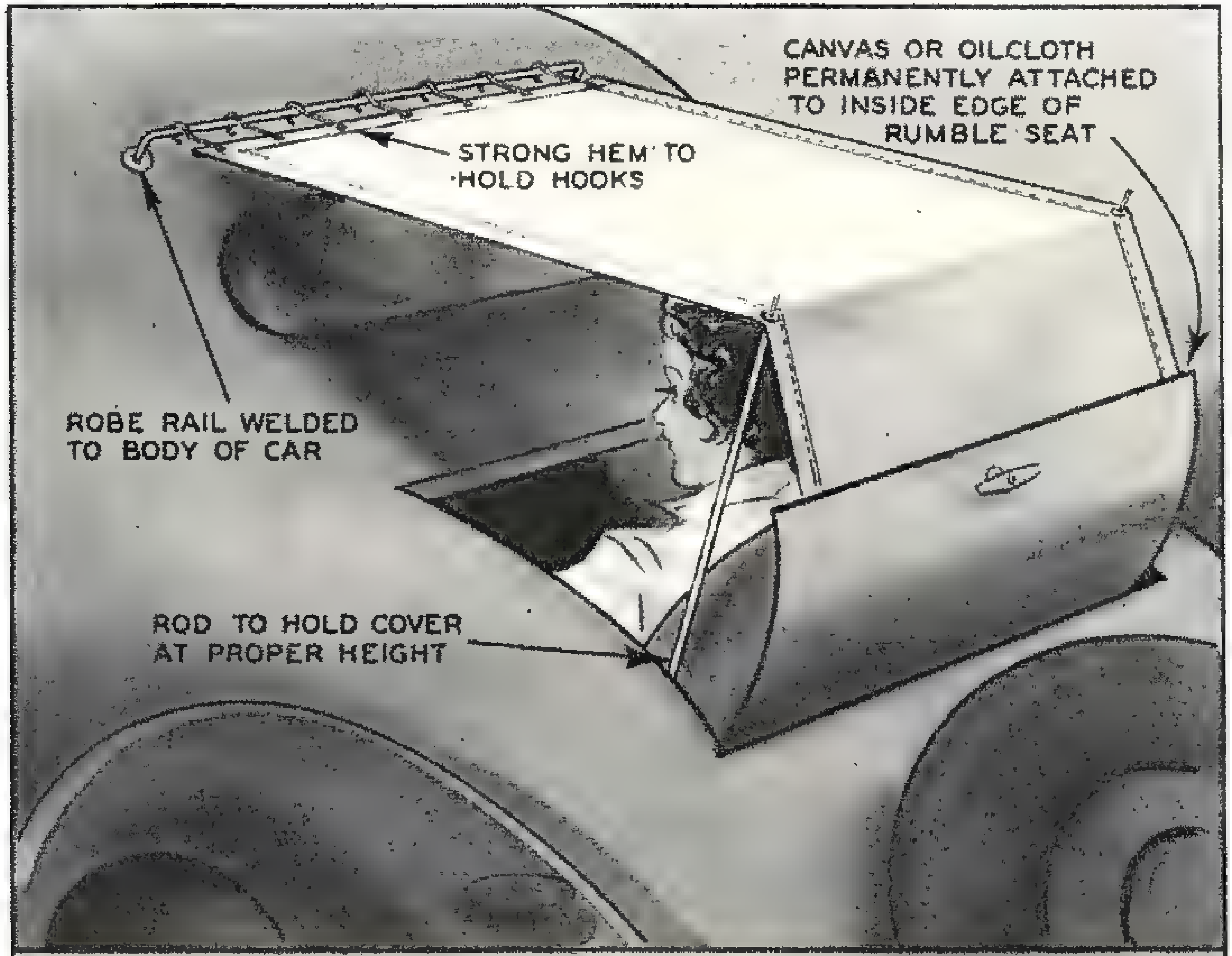
A medium size light bulb was set in each compartment to lie flat with a single extension cord serving both as shown. The sides of the can should be extended down far enough on the sides to keep glare out of the players' eyes.


SLIT CAN TOP AND BEND TO PERMIT POURING OF CONTENTS
1 GALLON TIN CAN
TOP AND SIDES OF CAN ARE CUT
NAILS TO BE DRIVEN INTO JOIST
FINISHED REFLECTORS

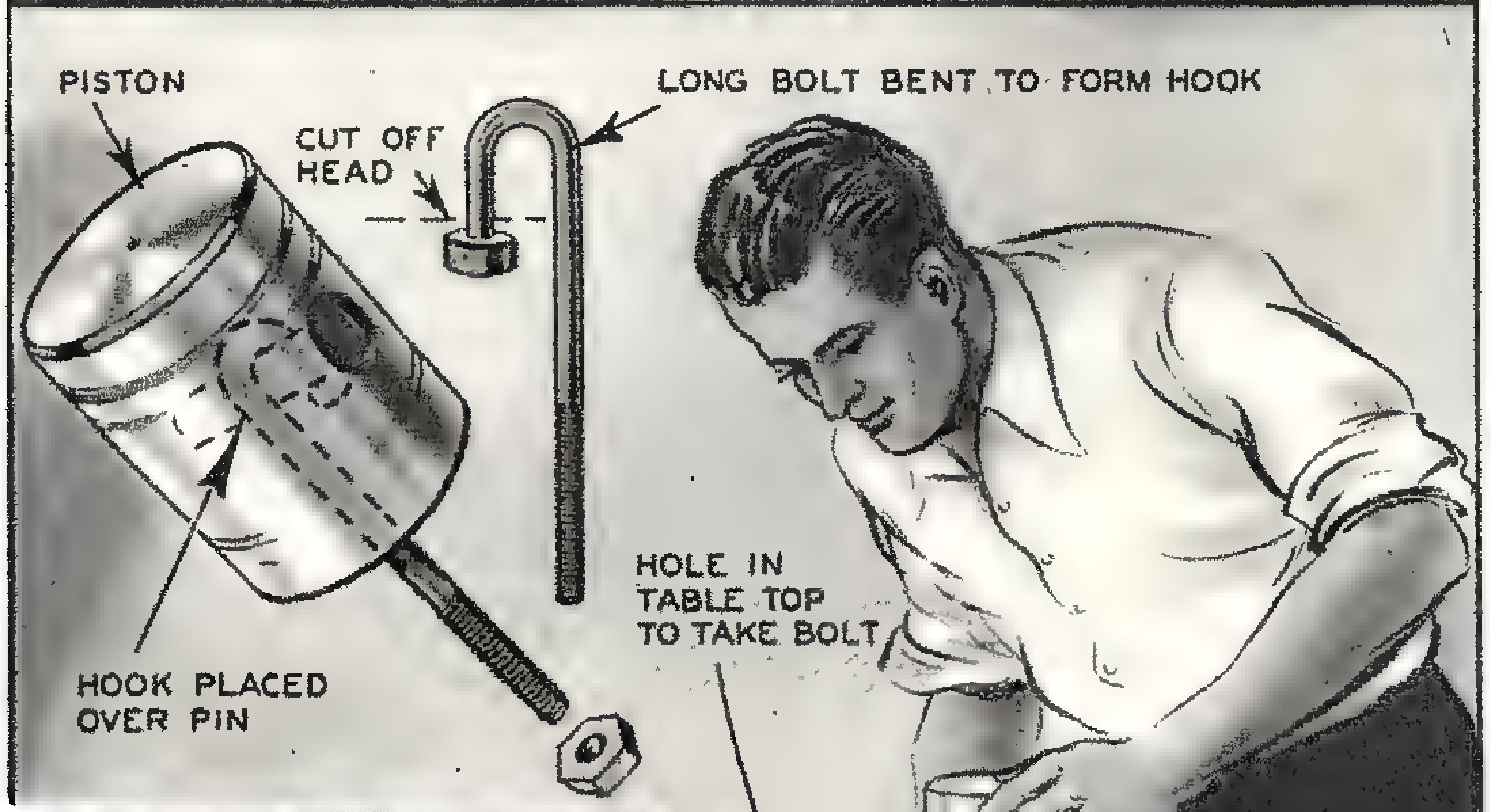


The top photograph shows the reflector completed and ready to be installed into the ceiling. Below—The lights in place and ready to supply ample illumination for Ping Pong table.

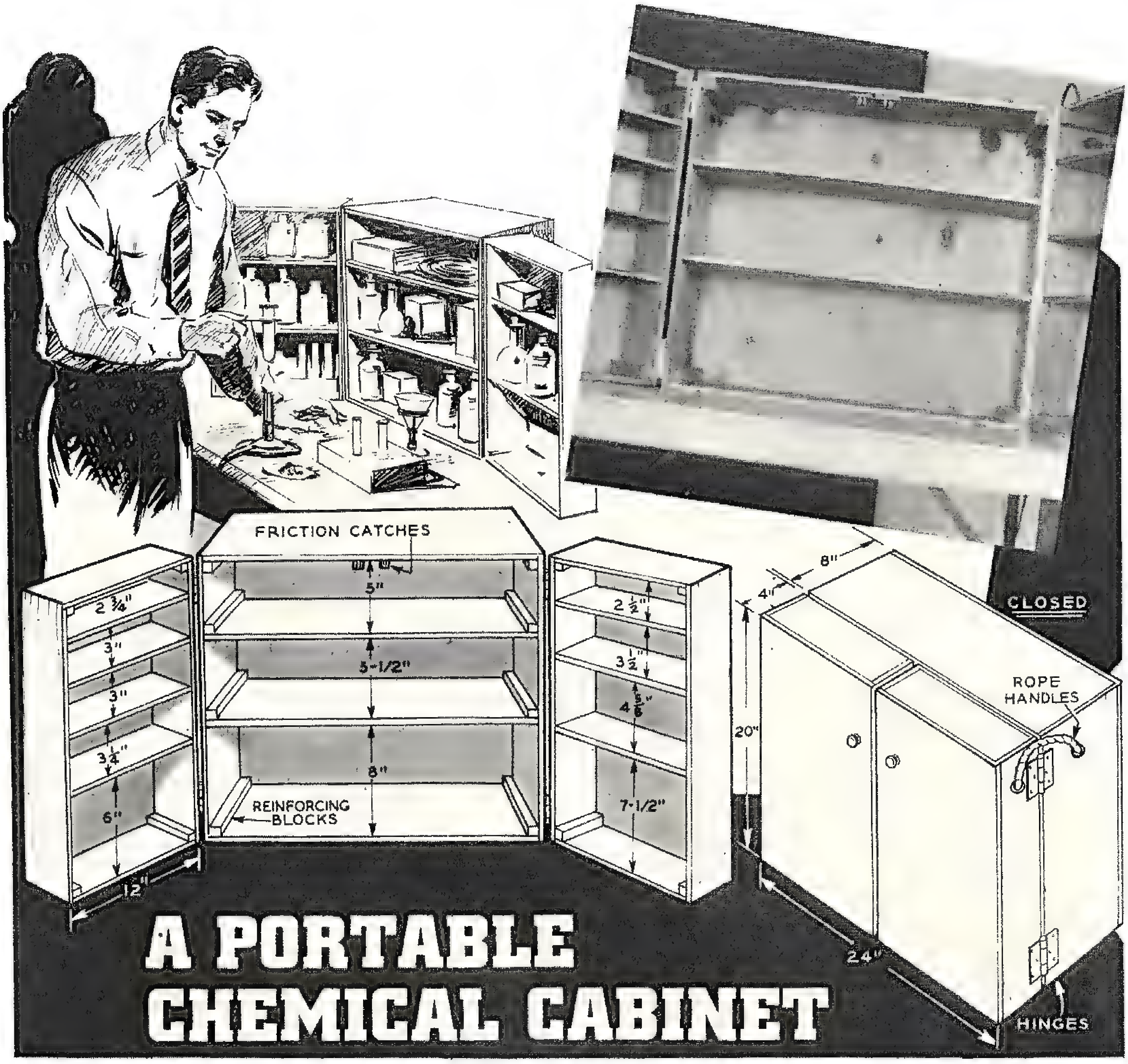
Timely Auto Kinks


CANVAS OR OILCLOTH PERMANENTLY ATTACHED TO INSIDE EDGE OF RUMBLE SEAT
STRONG HEM TO HOLD HOOKS
ROBE RAIL WELDED TO BODY OF CAR
ROD TO HOLD COVER AT PROPER HEIGHT

A STRIP of canvas, some hooks and an old robe rail can be made into an efficient cover for a rumble seat. The robe rail is welded to the top of the car so that the cover can be hooked to it when needed. The rear end of the canvas should be fastened to the back cushion of the rumble seat. Approximately seven hooks will be needed for holding the front edge to the rail. Two short rods are used to hold the rear part of the cover above the passenger's head. When the cover is not needed, it can be rolled up and placed behind the cushion. Lower right — When pistons are being scrapped, it is difficult at times to hold them securely to the table top. However, the problem can be solved by bending a bolt as shown in the drawing, and hooking it over a wood pin or dowel passed through the wrist pin bearings. The piston then can be held securely in position.


PISTON
CUT OFF HEAD
LONG BOLT BENT TO FORM HOOK
HOLE IN TABLE TOP TO TAKE BOLT
HOOK PLACED OVER PIN

HARD-TO-FIND noises can be located more easily by use of the motor stethoscope shown at the left. The device consists of a tin can open at one end, fastened by a nail through its bottom to a wood dowel about 18 inches long. Increasing loudness of the noise as the rod is moved near the defective part locates source of trouble.



A PORTABLE CHEMICAL CABINET

MANY persons who would like to become amateur chemists are handicapped by the apparent lack of space for a permanent laboratory and bench in their home or apartment. This portable cabinet will eliminate such a problem.

Easily constructed with a few ordinary hand tools found in almost every home, the cabinet is built entirely of ⅜-inch cypress or any other suitable wood.

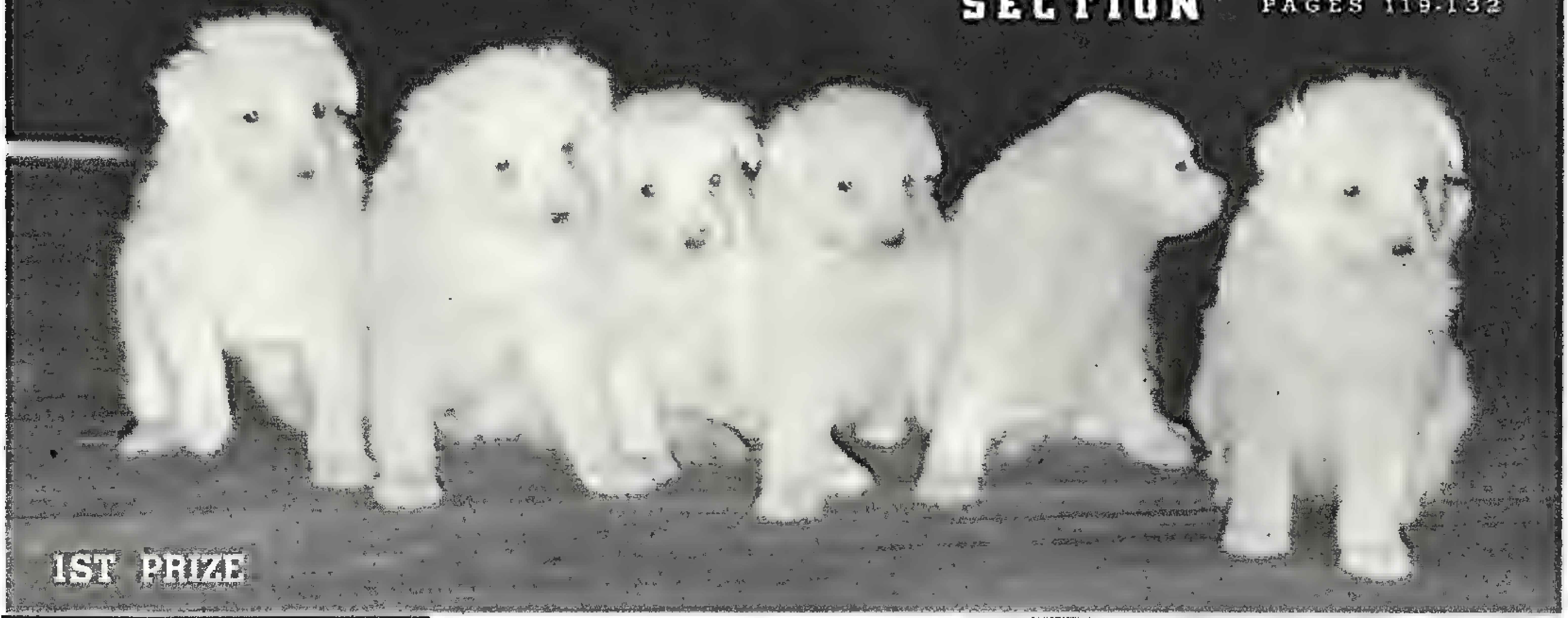
The main center section is constructed first. The top, bottom, sides and shelves are made of 8-inch material nailed together with the end pieces on the outside. The back is built up of three 8-inch pieces as long as the sides, which measure 20 inches. The top, bottom and shelves are 23¼ inches long. This gives an overall width of 24 inches for the center section. Four ⅞-inch square blocks, 8 inches long are screwed into the corners as reinforcements.

The two swinging doors are made in the same manner as the main section except that the top, bottom, sides and shelves are made of 4-inch stock and the fronts are built up of two 6-inch boards. The sides and fronts of the doors are of the same length as the main section's sides and back. The shelves, top, and bottom are 11¼ inches long. Reinforcing blocks are fastened on to the doors in the same manner as to the central section.

Two fairly large hinges are used to support each door. However, these will have to be fastened on with bolts instead of the usual wood screws, as the latter will not hold very well because of the thinness of the wood. One of the new, modernistic, metal drawer knobs makes an excellent handle for each door. Rope handles, installed at each side of the cabinet in the manner illustrated, simplify the task of carrying this portable and compact cabinet about.

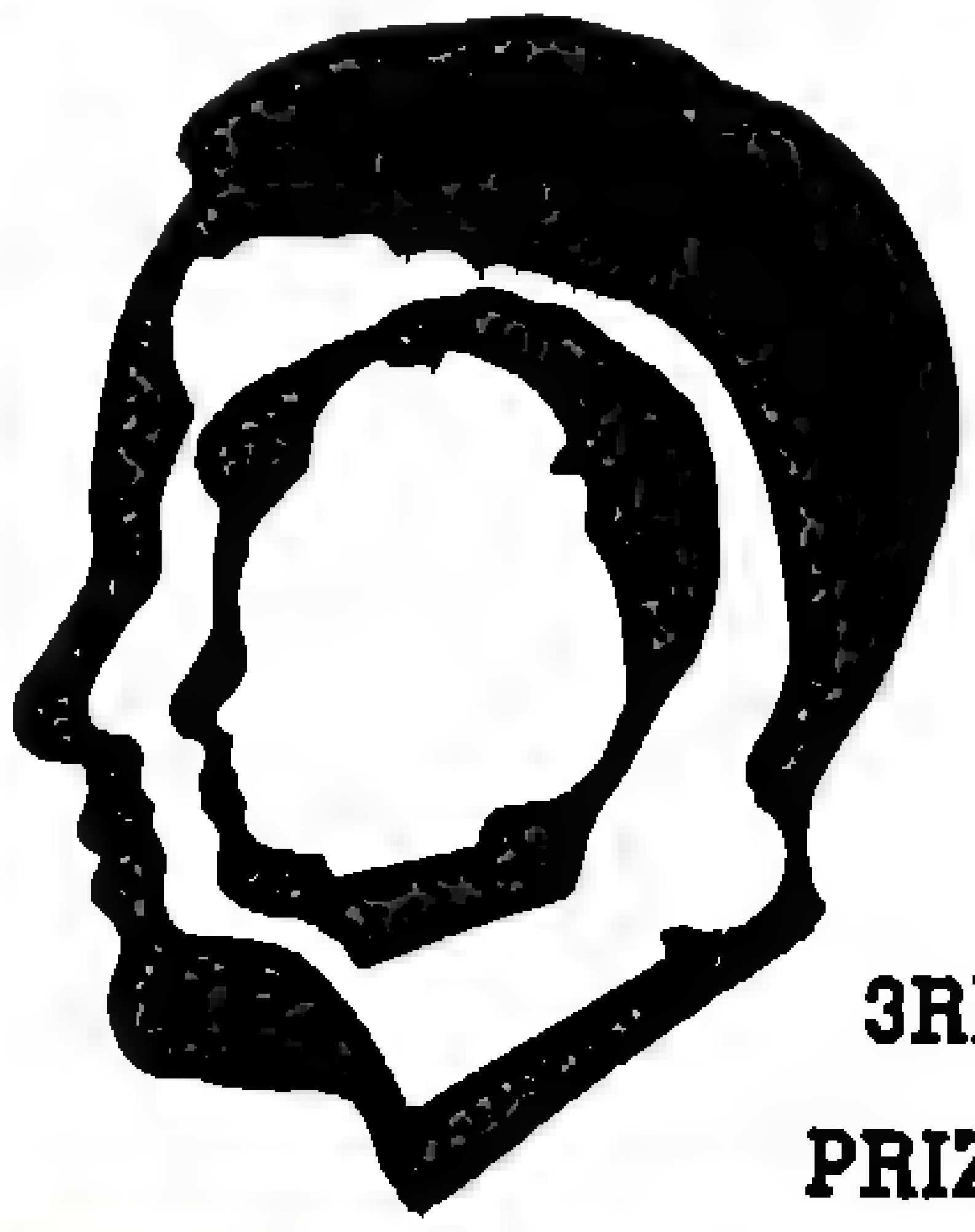
MECHANIX ILLUSTRATED PHOTOGRAPHY SECTION

PAGES 119-132

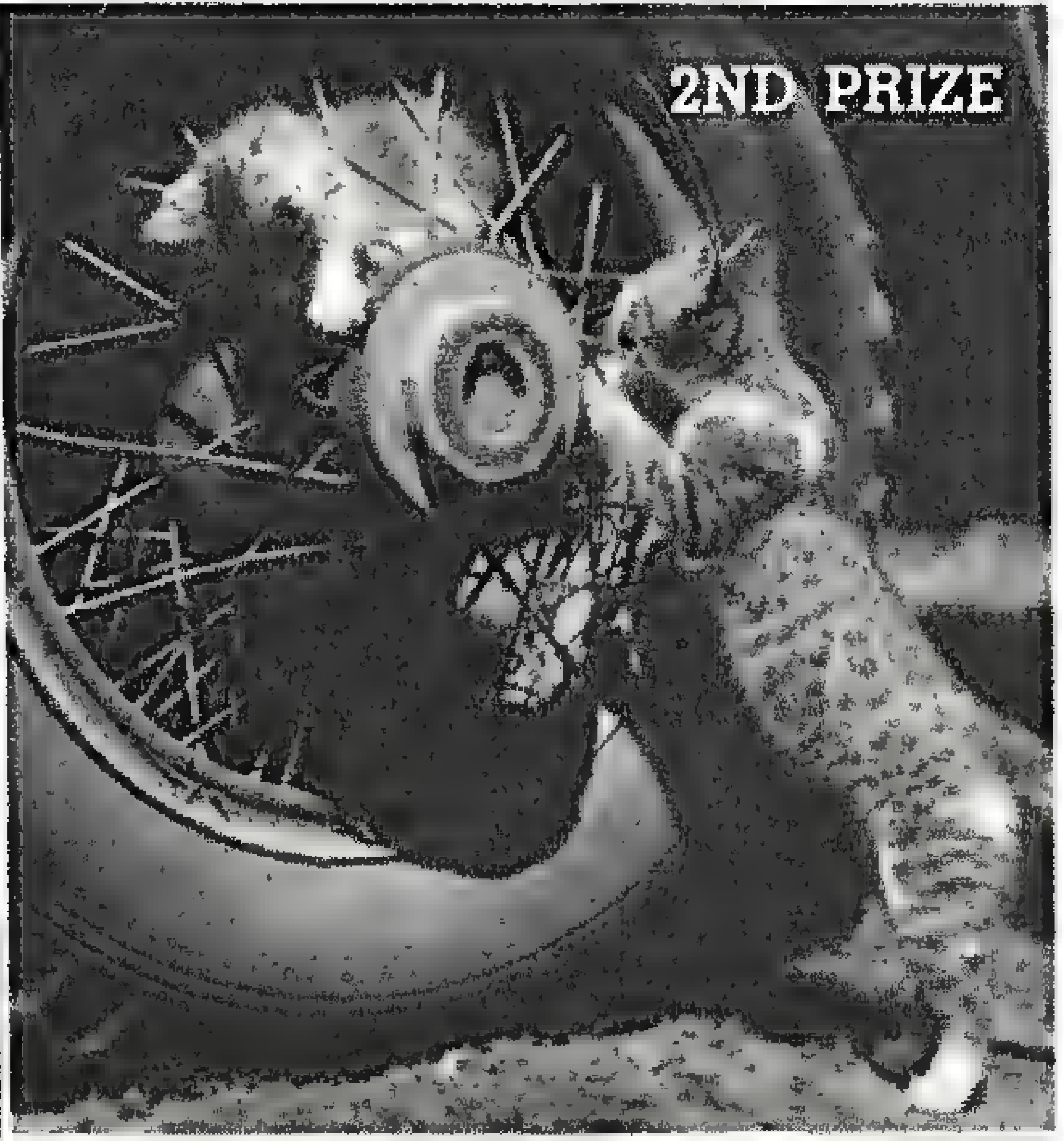


1ST PRIZE

FIRST PRIZE: "SEXTUPLETS" by P. M. Wolgemuth, Hershey, Pa. Taken with Voigtlander 9x12 cm. at f.22 and 1/50 sec. on super pan press film. SECOND PRIZE: "STUCK" by H. A. Carter, Toronto, Canada. Rolleocord, f.5.6 at 1/100 sec. using pan film developed in D 76. THIRD PRIZE: "FAMILY SILHOUETTES" by E. E. Lauren, Detroit. Taken with a Kodak at f.11 and ½ sec. Each silhouette taken separately, combined and photographed. FOURTH PRIZE: "FISHIN'" by Richard Wood, N. Chattanooga, Tenn. Taken with Korona V, at f.11 and 1/25 sec. FIFTH PRIZE: "FIRST AID" by Louis Hochman, Brooklyn, N. Y. Medical instruments placed on enlarging paper and image projected over them. Scene taken with Foth Derby at f.5.5 and 1/100 sec.

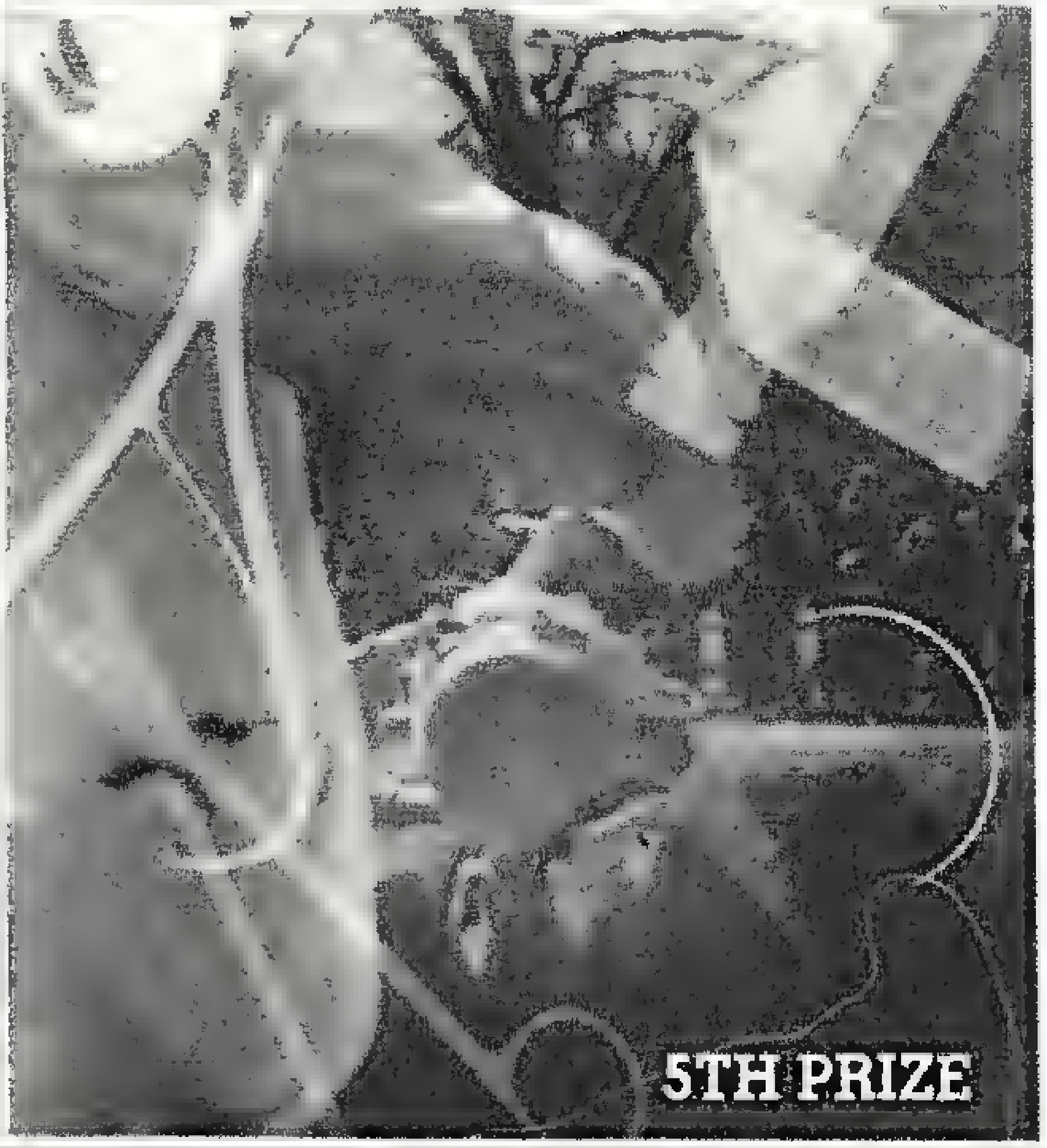


3RD PRIZE



2ND PRIZE

4TH PRIZE



5TH PRIZE

MONEY FOR YOUR PICTURES

Get busy with your camera and send in unusual pictures of people, animals, machines, trains, airplanes, etc. Each month we will pay $15 for the best picture received from readers, $10 for the second choice and $5 each for the next three selections. Prints should be glossy, as large as possible up to 8x10 inches (although a small, clear photo is more desirable than a big, fuzzy one) and should be accompanied by the following data: make and size of camera, type of film, and how developed and printed, lens opening and shutter speed, and lighting conditions. Wrap all prints carefully and include postage if you want them returned. Address all contributions to Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

Seeing Things at Night

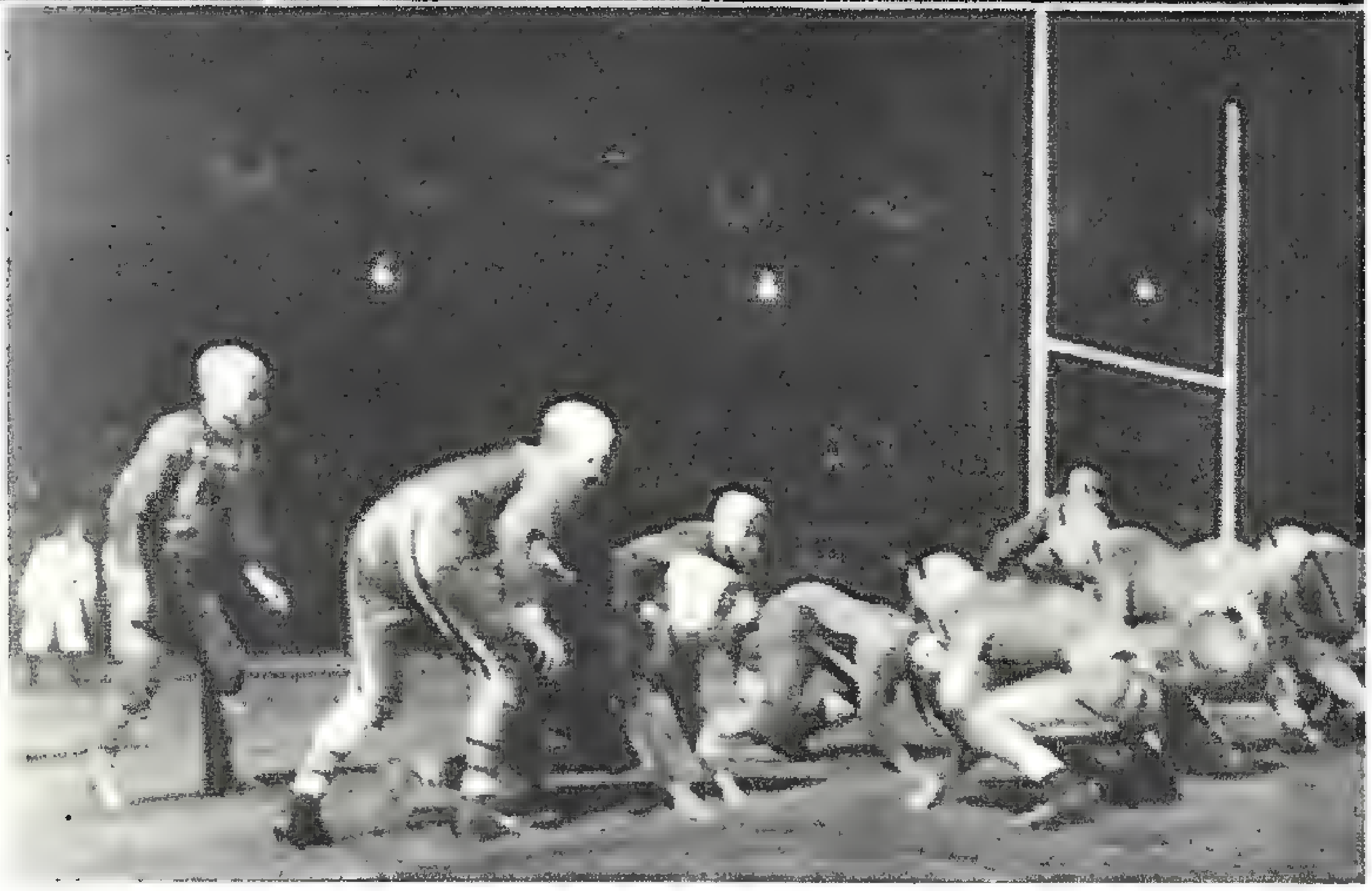
Above—Factory in silhouette at night makes a striking photo. White lines are from auto headlights. Left—Three minutes at f-6.3 with camera on a tripod got this night scene. Note reflections in water.

AFTER the sun burns red behind long-streaked clouds, when blackness settles over landscapes, and only moonlight, lightning flashes and lonely street lights sparkle in your view-finder—that is the time to take the best photographs.

Take your camera out at night! Get the solid blacks, the beautiful, glowing highlights, the sharp silhouettes that only nocturnal picture-taking can give you. It's easy, whether you have a cheap box camera or an expensive super-super, complete with fast lenses, tripod and chromium gadgets. You need a "time" setting for your shutter, and a steady support—nothing more. Not even ultra-speed film is required, for some of the best night shots have been taken with pinhole cameras and slow film.

Try something you already know by sunlight. An old church in the moonlight, or a picturesque flight of stone steps glinting under an owlish street lamp. Try something commonplace—a pile of burning leaves or your own house with every window lighted

by John R. Whiting



Above—Silhouette made at f-3.5 in 30 sec. Above right—50 sec. at f-6.3. Wet streets gave interesting reflections. Right—An f-3.5 opening at 1/10 sec. was enough to stop this night football scene. Newsmen would use a flash for it.

up; it will look ten times more glamorous by night.

Getting glamour in night photographs is easy if you remember a few simple rules:

1. Select a clear evening, for sharpness, unless you have a special cloud and fog effect in mind. A clear night after a rain is good, for you get sparkling reflections.

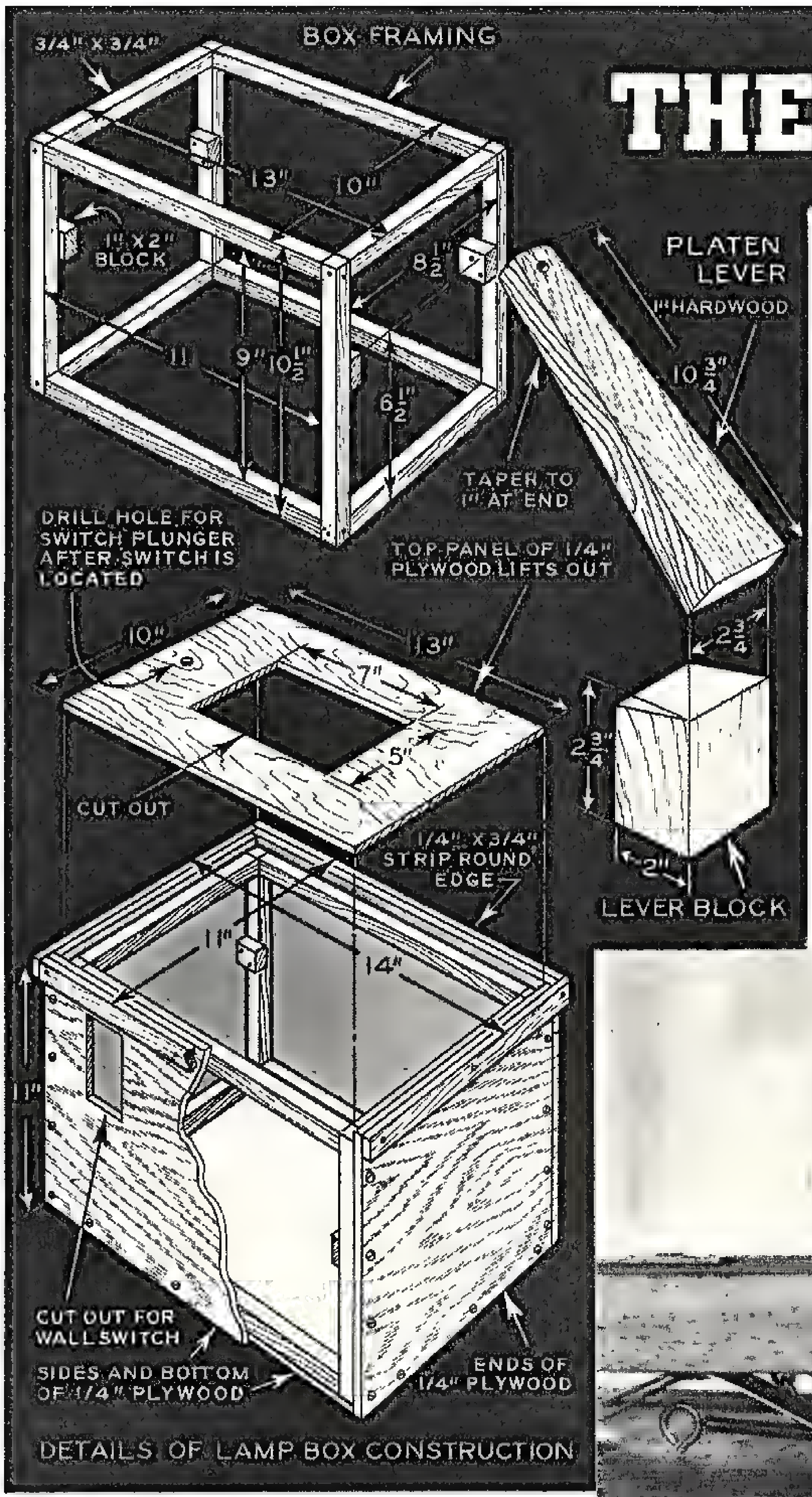
2. Watch your composition especially, for when you've nothing but high-lights and rich, black shadows you can't make up for lack of interest with a girl in a bathing suit and a big smile. Try to pick a center of interest, some simple pattern of stairs or a row of street lights or a startling silhouette and frame it just off center.

3. Make sure your camera has a steady support. If it's on a tripod, beware of vibrations and of brushing carelessly against the legs. If you have no tripod, don't worry; you can securely place even a box camera on a rock, on top a fence post, or perhaps on the roof of your car.

4. Take plenty of time. Long exposures will get detail. Try an ordinary scene such

[*Continued on page* 137]

THE PHOTOPRINTER


3/4" x 3/4"
BOX FRAMING
13"
10"
1" x 2" BLOCK
8 1/2"
11
9"
10 1/2"
6 1/2"
PLATEN LEVER
1" HARDWOOD
10 3/4"
TAPER TO 1" AT END
DRILL HOLE FOR SWITCH PLUNGER AFTER SWITCH IS LOCATED
TOP PANEL OF 1/4" PLYWOOD LIFTS OUT
10"
13"
7"
5"
2 3/4"
2 3/4"
CUT OUT
1/4" X 3/4" STRIP ROUND EDGE
2"
LEVER BLOCK
11"
14"
11"
CUT OUT FOR WALL SWITCH
SIDES AND BOTTOM OF 1/4" PLYWOOD
ENDS OF 1/4" PLYWOOD

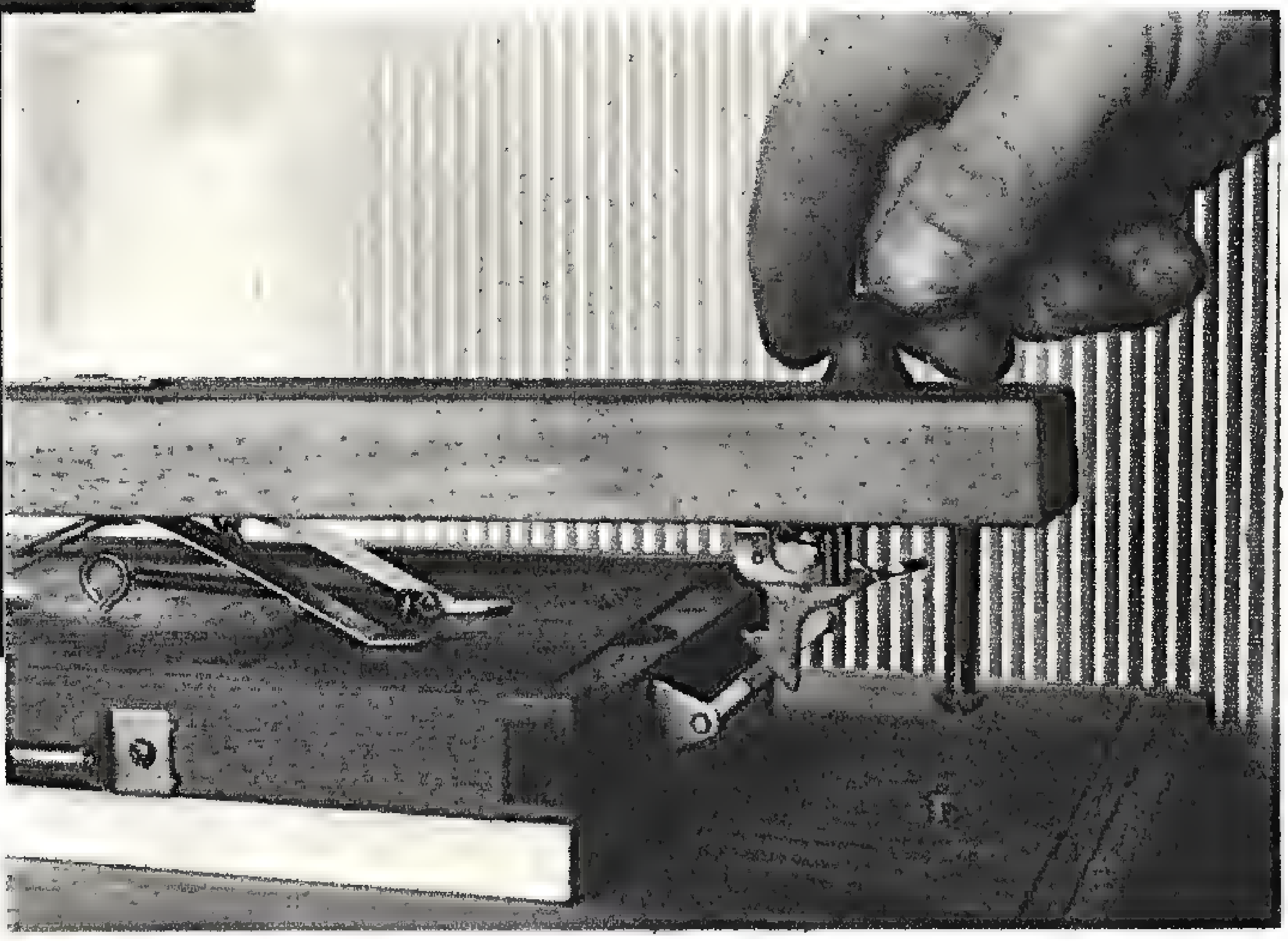
DETAILS OF LAMP BOX CONSTRUCTION

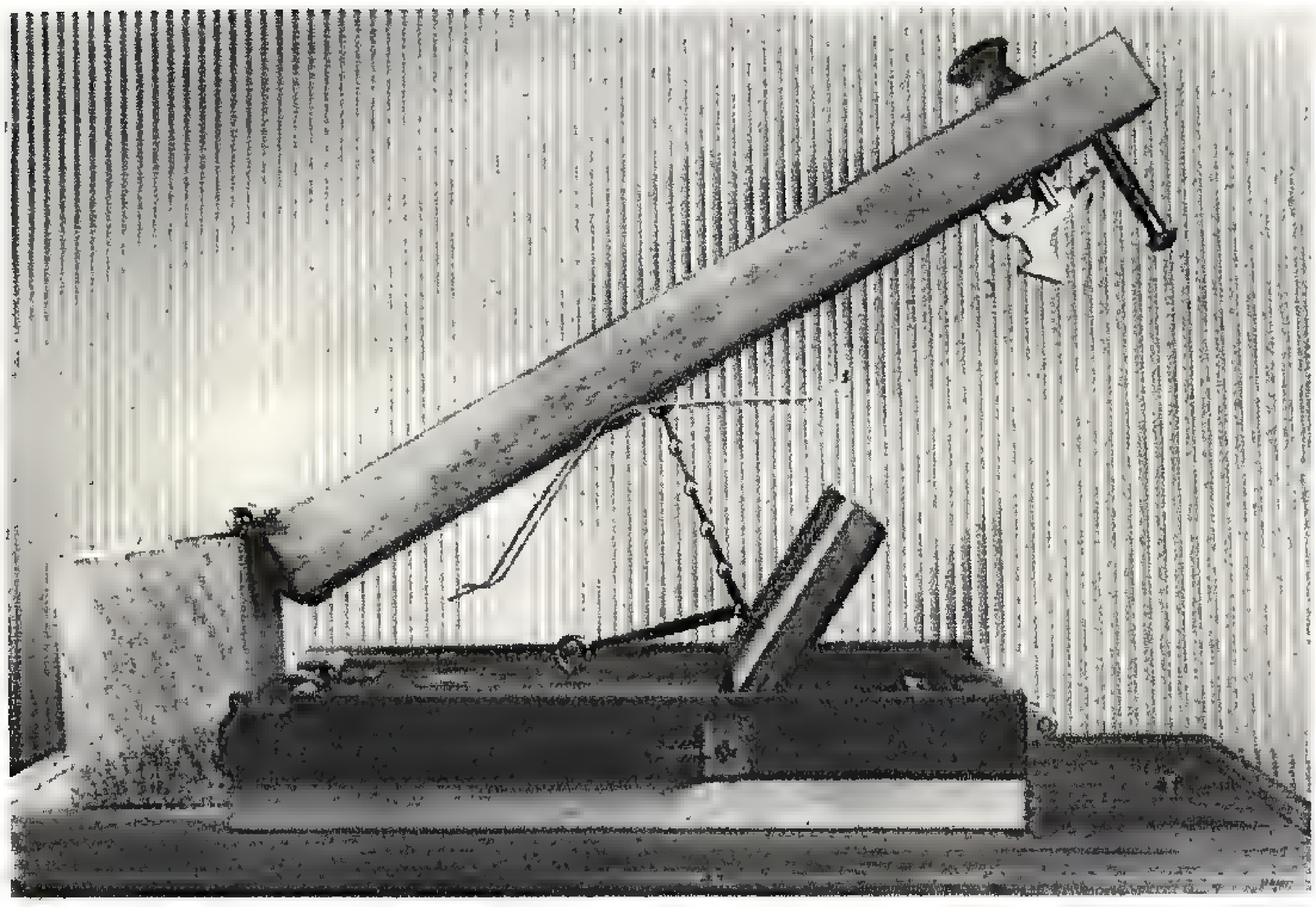
IF IT is simplicity of construction and low cost that you want in a contact printer, here is the job for you. It is by no means an amateur outfit, however. "Semi-professional" would be a more descriptive term, as it has appointments found on commercial printers and will do work of professional quality at professional speed.

The box of the model illustrated was built of ¼-inch plywood and given a coat of metallic paint. If you wish something really superior, use black tempered Presdwood and finish it with furniture wax. The box is 11 inches high, 11 inches wide and 14 inches long, and is constructed around a framework of ¾-inch square pieces of wood, following dimensions given in the drawing. Attach small wood blocks to each upright member to support an 8½ by 12-inch sheet of glass. The plywood or Presdwood bottom, sides and ends are then attached with brads or screws and finished with ¼ by ¾-inch strips of wood around the top. The latter will then project ¼-inch above the frame so that the top panel can be dropped in place.

Screw five receptacles to

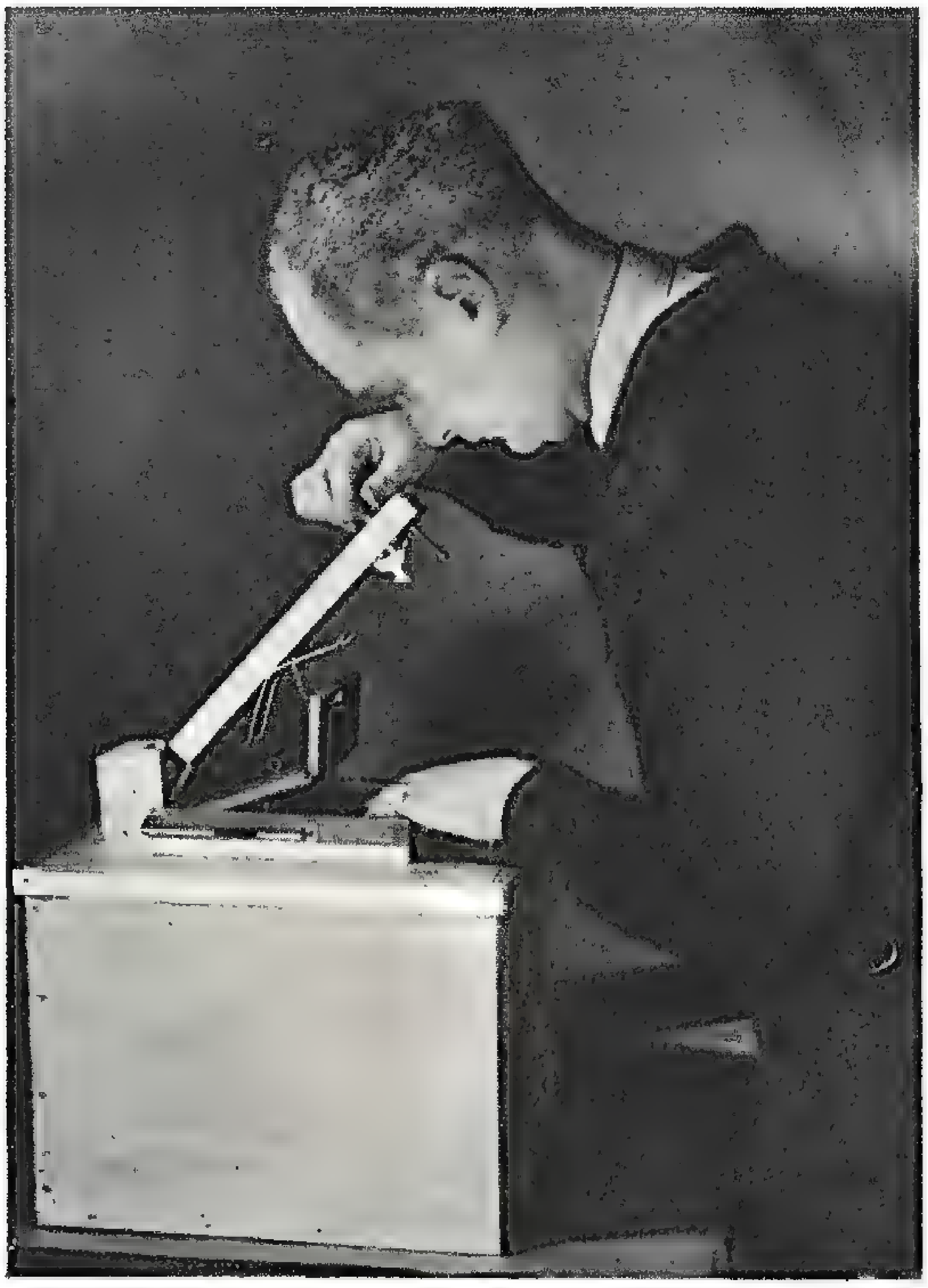
Right: When the lever is lowered, the long screw pushes down the plunger of the exposure switch. The latch may be used to lock the platen for long exposures or local control. **Below:** The platen lever partly raised to show pressure springs, chain, and coil spring. See construction details above.





"SIMPLICITY"

The top of the printer may be raised for "local control" or to give additional exposure to any part of the print with a concentrated beam of light, such as obtained from a "pen light" flashlight.

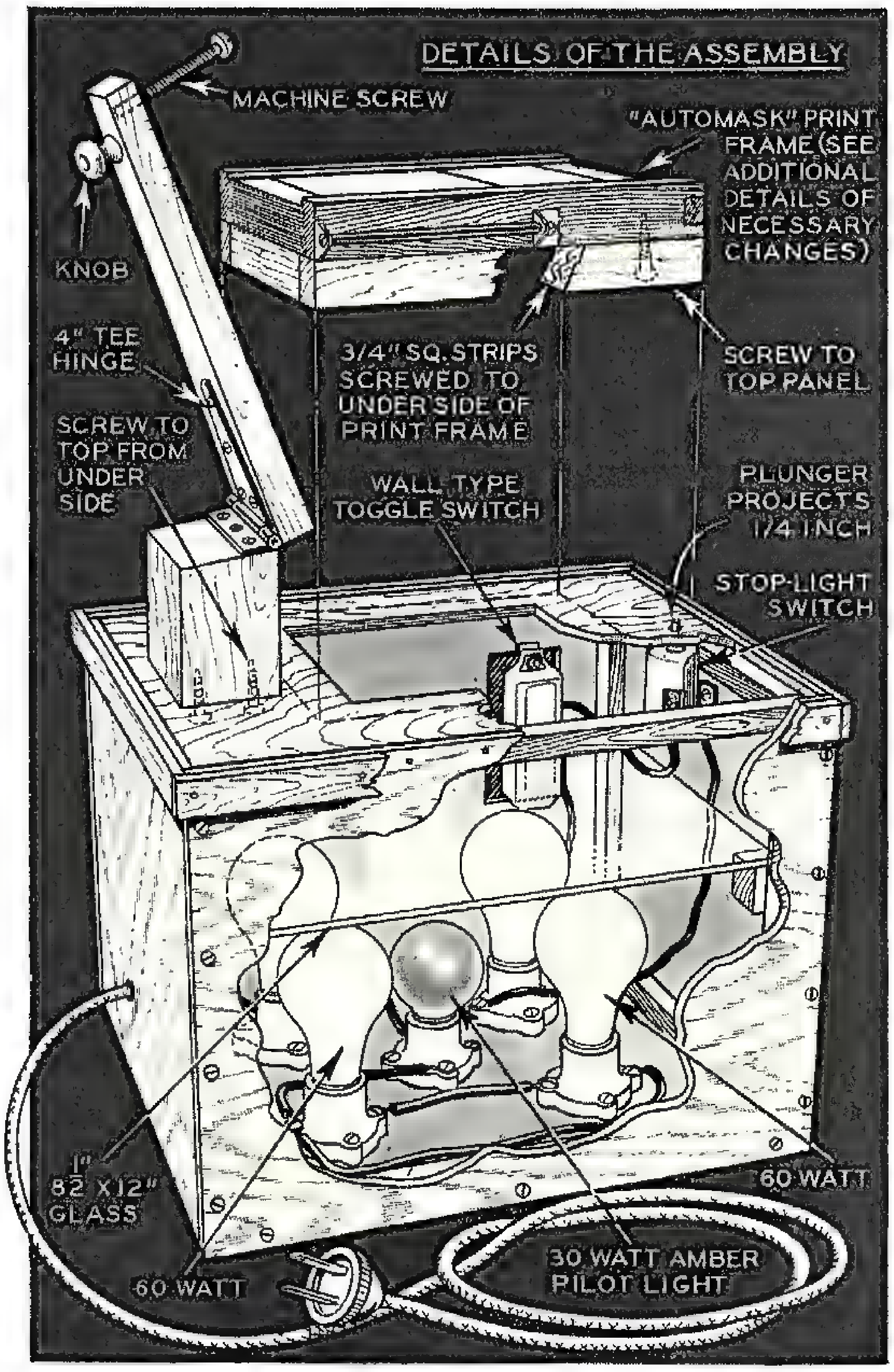


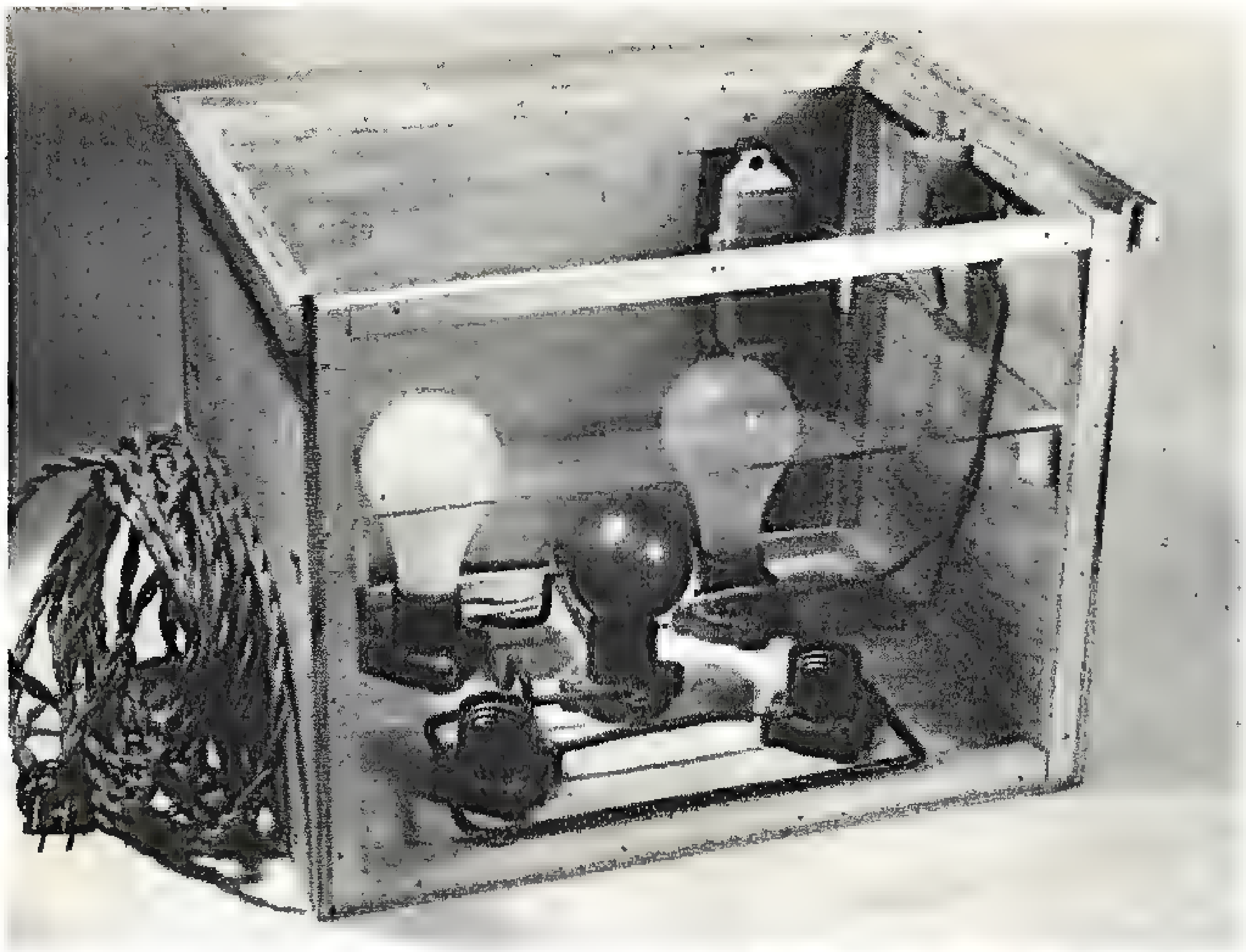
This easily-made photoprinter will enable you to turn out perfect contact prints in the least possible time. It is a valuable addition to any dark room.

the bottom for one 30-watt red or amber pilot light and four 60-watt lamps, and cut an opening in one side of the box for a toggle switch. This lights the pilot lamp and, as you can see from the wiring diagram, the circuit for the 60-watt lamps is automatically closed when negative and paper are brought into contact by lowering the platen. This is accomplished with an automobile stop-light switch which is screwed to one end of the box so that the plunger, which should be reversed in its housing, projects ¼-inch above the top.

On the sheet of glass you may lay one or more sheets of tissue paper for adequate diffusion of the light. For special effects, or negatives of uneven density, the tissue should be positioned accordingly.

In order to make prints having real quality, it is necessary that the negative and paper be held in perfect contact. Accuracy in this respect being important, in order to simplify


DETAILS OF THE ASSEMBLY
MACHINE SCREW
"AUTOMASK" PRINT FRAME (SEE ADDITIONAL DETAILS OF NECESSARY CHANGES)
KNOB
4" TEE HINGE
3/4" SQ. STRIPS SCREWED TO UNDER SIDE OF PRINT FRAME
SCREW TO TOP PANEL
SCREW TO TOP FROM UNDER SIDE
WALL TYPE TOGGLE SWITCH
PLUNGER PROJECTS 1/4 INCH
STOP-LIGHT SWITCH
8½ X 12" GLASS
60 WATT
60 WATT
30 WATT AMBER PILOT LIGHT

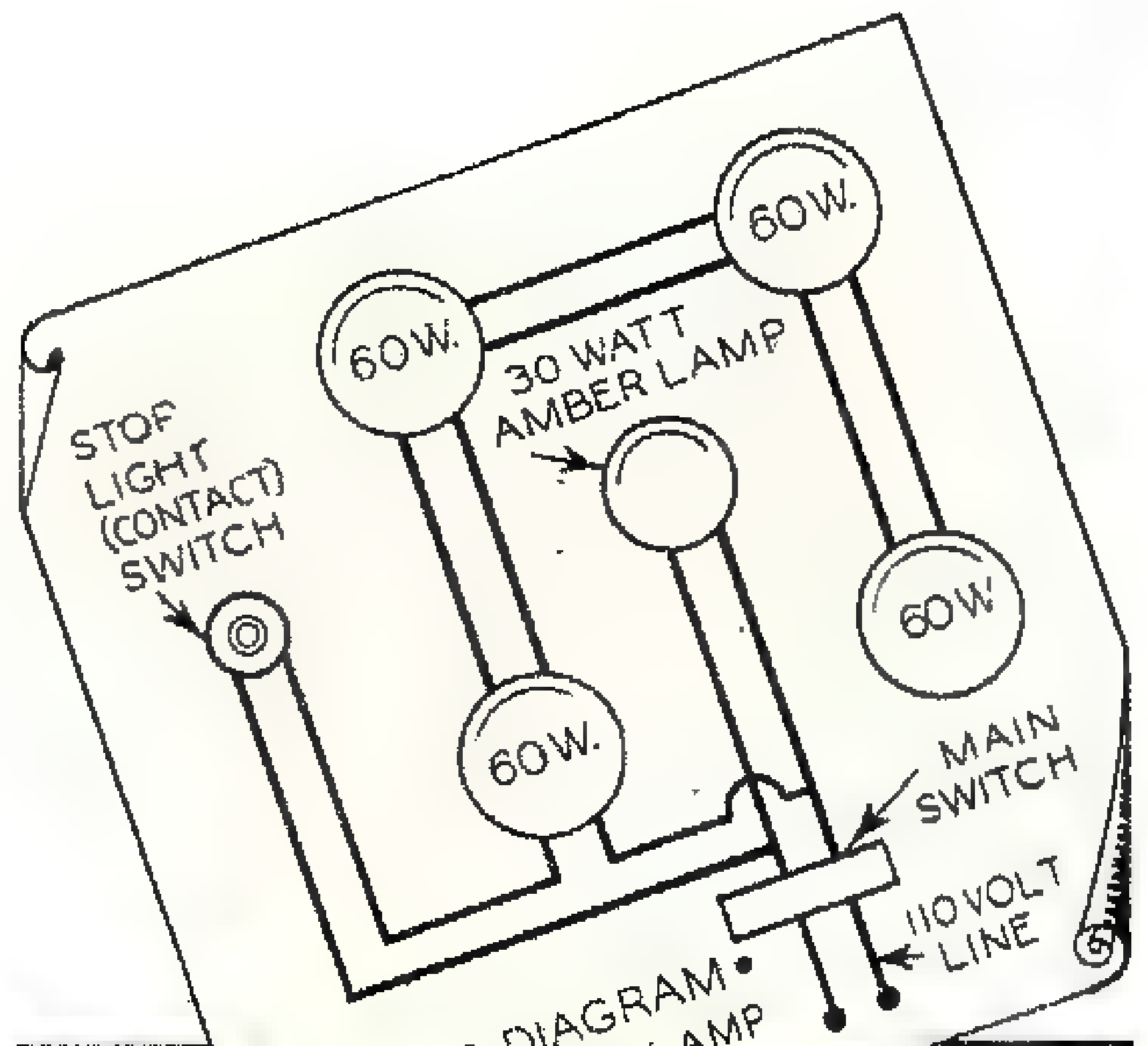


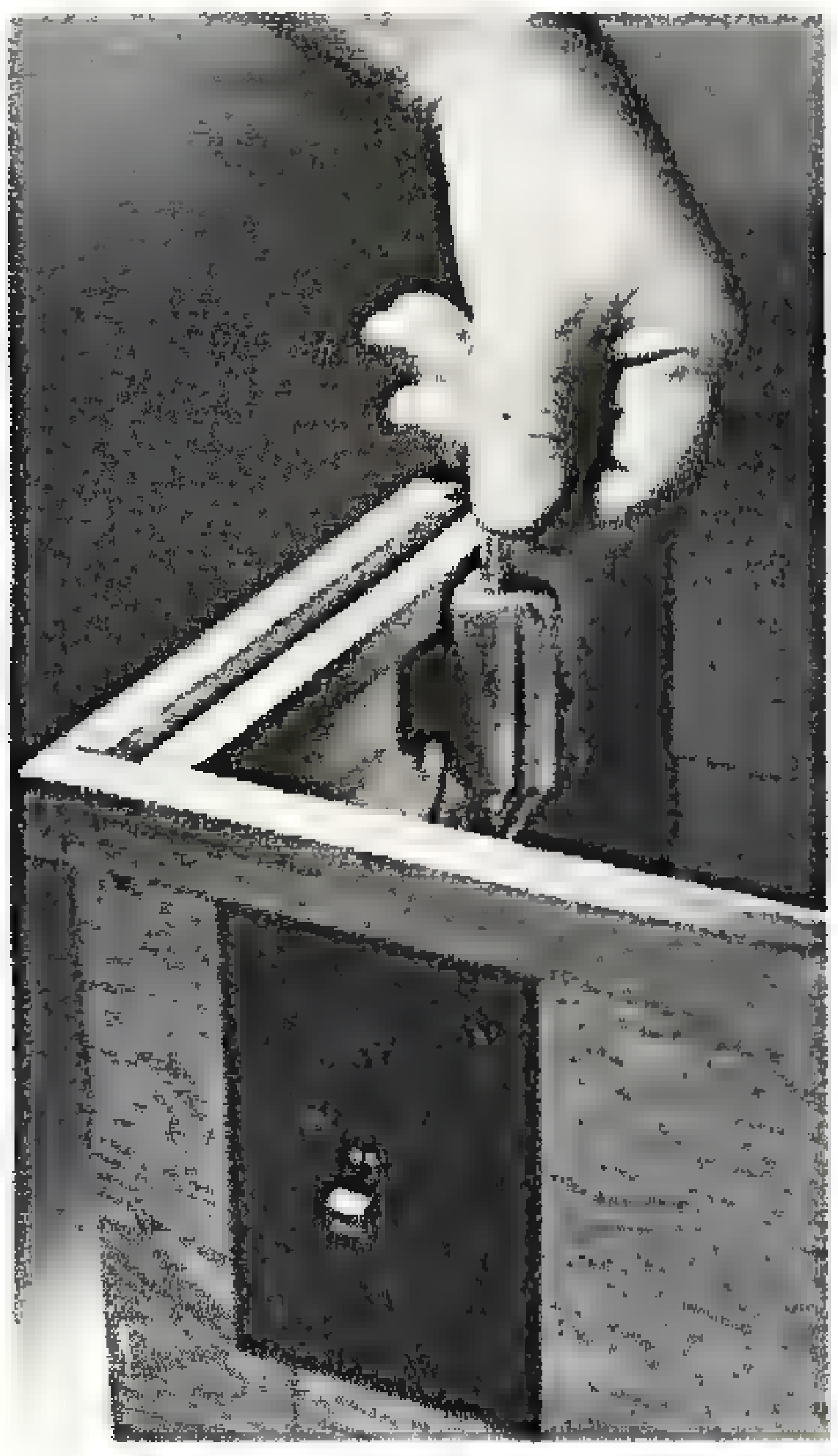
The printer with one side removed, showing arrangement of lamps and glass for diffusing tissue.

construction use is made of a 4x5-inch printing frame. As an automatic masking device of some kind is desirable, the Eastman Automask print frame was adapted. This costs $1.35, which is the principle item of expense in building the printer.

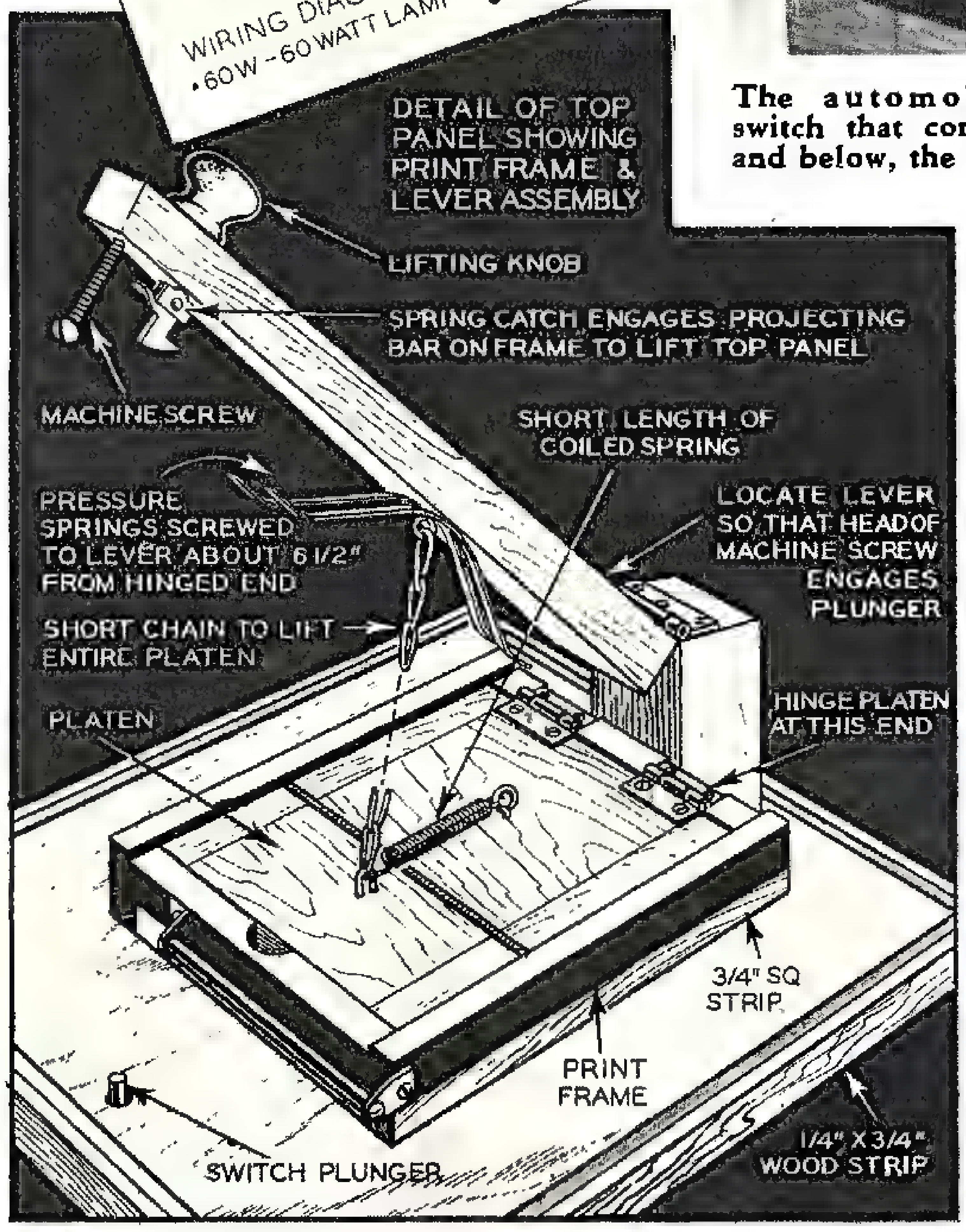
Screw ¾-inch wood strips to the face of the frame, in order to raise it, and attach the strips in turn over a 5x7-inch hole cut in a 10x13-inch panel which forms the top of the box. From the hinged platen of the frame remove the two pressure springs and hinge one end of the platen to one end of the frame. The illustrations make clear how a wood lever with the pressure springs attached is mounted on a wood block screwed to the panel, and where to attach a short lifting chain and coil spring so that the action will be equal to that of commercial printers.

Drill a hole in the handle of the lever for a long machine screw so that the latter will press down the contact switch plunger, the end of which projects through a hole in the panel, when the lever is at its lowest point. The screw is of course adjustable as to length. Also attach to the underside of the handle a spring catch so that it will engage the projecting bar of the frame masking device. The catch is used only when the panel is to be lifted in order to expose parts of the negative separately to allow local control.


60W.
60W.
30 WATT AMBER LAMP
STOP LIGHT (CONTACT) SWITCH
60W
60W.
MAIN SWITCH
110 VOLT LINE
WIRING DIAGRAM
•60W - 60 WATT LAMP

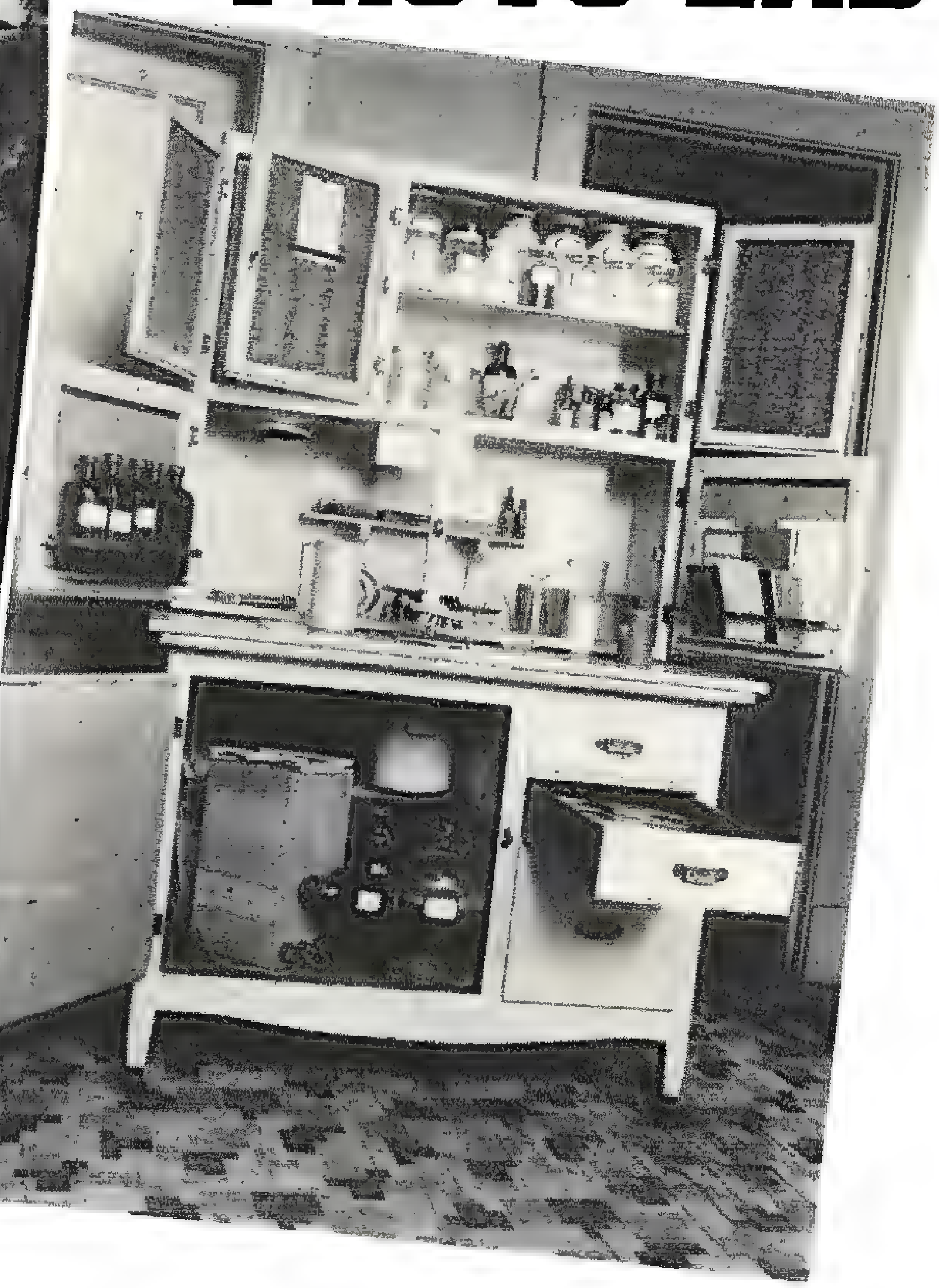


The automobile stop-light switch that controls exposure, and below, the entrance switch.


DETAIL OF TOP PANEL SHOWING PRINT FRAME & LEVER ASSEMBLY
LIFTING KNOB
SPRING CATCH ENGAGES PROJECTING BAR ON FRAME TO LIFT TOP PANEL
MACHINE SCREW
SHORT LENGTH OF COILED SPRING
PRESSURE SPRINGS SCREWED TO LEVER ABOUT 6 1/2" FROM HINGED END
LOCATE LEVER SO THAT HEAD OF MACHINE SCREW ENGAGES PLUNGER
SHORT CHAIN TO LIFT ENTIRE PLATEN
PLATEN
HINGE PLATEN AT THIS END
3/4" SQ STRIP
PRINT FRAME
1/4" X 3/4" WOOD STRIP
SWITCH PLUNGER

Pressure springs are removed from the Automask printing frame and screwed to the wood lever.

KITCHEN CABINET BECOMES PHOTO LAB



A second-hand kitchen cabinet (right) can easily be converted into a compact photographic laboratory, providing space for supplies of chemicals, scales, graduates, etc. The left-hand upper compartment can be made into an efficient enlarger, as described in the text below. Above—The enlarger, with lens removed, being used as a light source for making contact prints. A built-in safelight with colored glasses serves to illuminate working area.

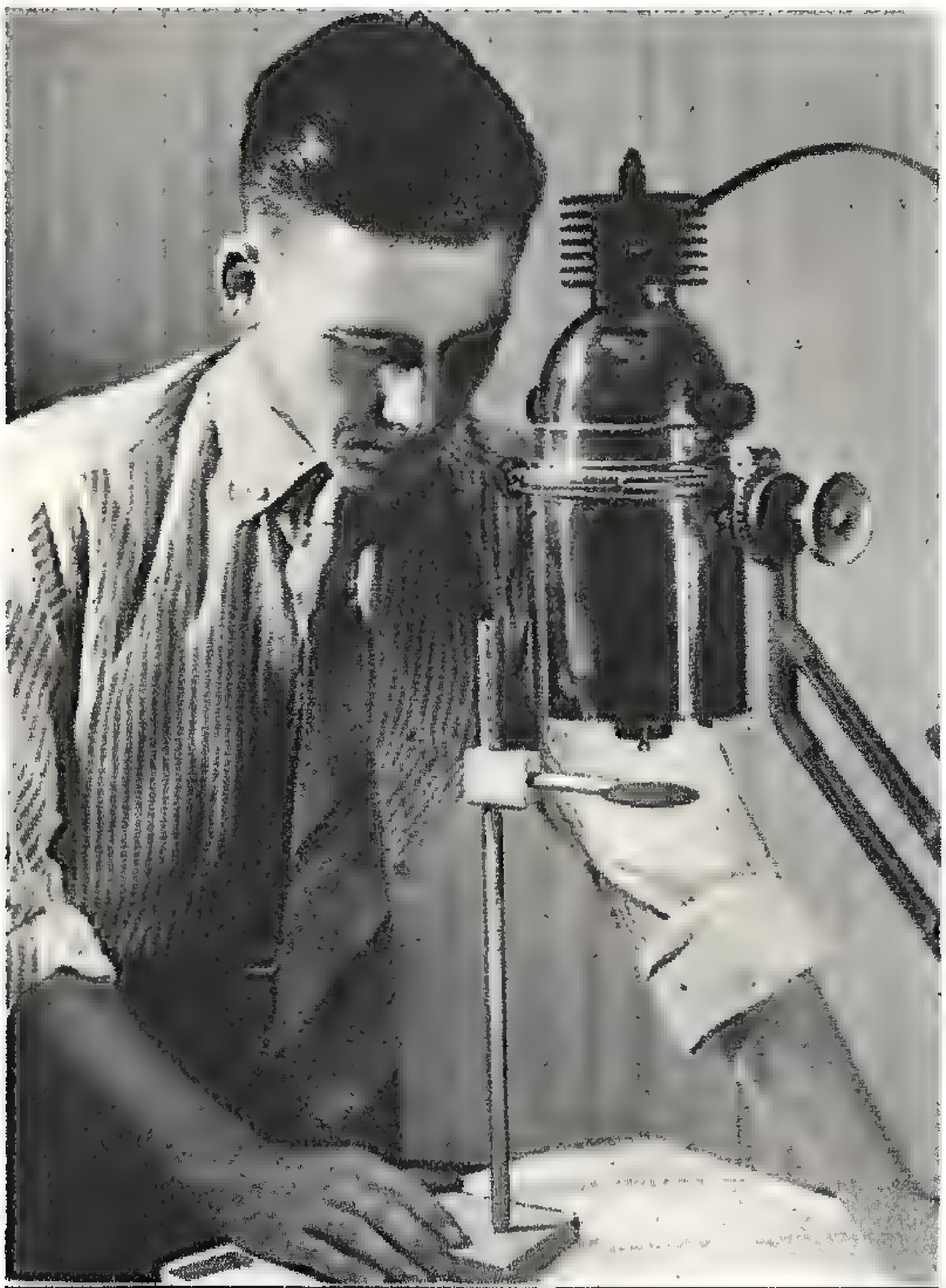
A HANDY compact photographic laboratory can be arranged by the amateur from an ordinary kitchen cabinet. As most modern homes now have built-in cabinets, discarded movable types can be picked up second-hand for as little as $5.00. Placed in the garage, spare room, basement, or wherever the photographic work is usually carried on, such a cabinet provides adequate storage for materials and equipment as well as space for printing, developing and mixing solutions.

The photographs accompanying this article show how space is provided for chemicals, scales, graduates, trays, solution bottles and jugs, enlarger, cameras, lighting apparatus, and photographic literature. The original flour compartment was altered to make a vertical enlarger. Four lights were mounted near the top with a piece of opal or ground glass several inches below. Holes in the back were necessary to provide the ventilation for the light compartment, which is painted white or lined with tinfoil.

Below the diffusion screen are a series of slots in which the glass negative holder slides. This is merely a sheet of glass which forms a shelf on which the negative is placed, dull side down. It is covered with a clean piece of glass to hold the celluloid flat. By moving this glass shelf closer or farther from the lens, different degrees of enlargement can be obtained. The lens is mounted at the bottom of the compartment and should be adjustable for focusing. With the lens removed, a printing frame can be substituted for the paper holder and the light then used for printing contact prints.

This compact photographic laboratory is particularly adaptable and valuable to the man living in a small apartment. It will please the housewife, too, for it means that her photo fan husband will now have a "place for everything and everything in its place."

DARKROOM



Separate Filter Avoids Vibration

The simple filter holder shown above removes the possibility of moving the enlarger as sometimes happens, when the built-in filter is turned in or out of the light beam. The entire assembly can be made of wood. The base should be no larger than necessary for supporting the filter solidly. It then can be moved out of the way without touching enlarger.

Removing Trademark From Photo Lamps

The trademark found on most light bulbs used for enlarging purposes can be removed easily and quickly by rubbing it with a small amount of ordinary valve-grinding compound.

Celluloid Protects Thermometer

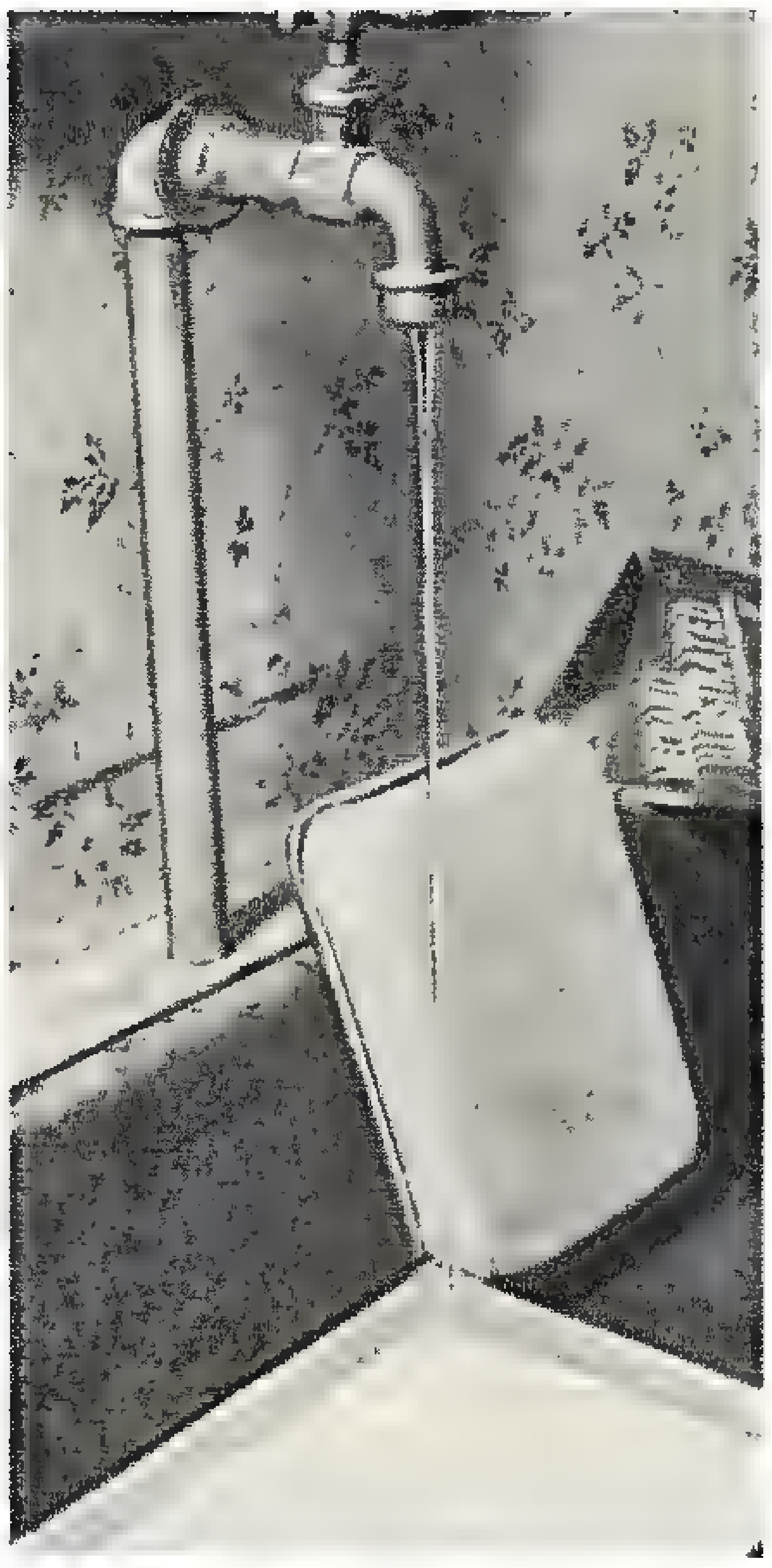
The bulb and column of a tray or tank thermometer can be protected against breakage with a piece of clear celluloid. Wrap it around the thermometer and weld the joint at the rear with a drop or two of acetone.

150
130
120
70
50
30

Test Paper For Hypo

Hypo test strips can be made easily and inexpensively by soaking white paper in a strong solution of potassium permanganate and water. After the strips have dried thoroughly, they are ready for use. Dip them in the water to be tested and if the deep purple color fads, hypo is present.

SHORTCUTS



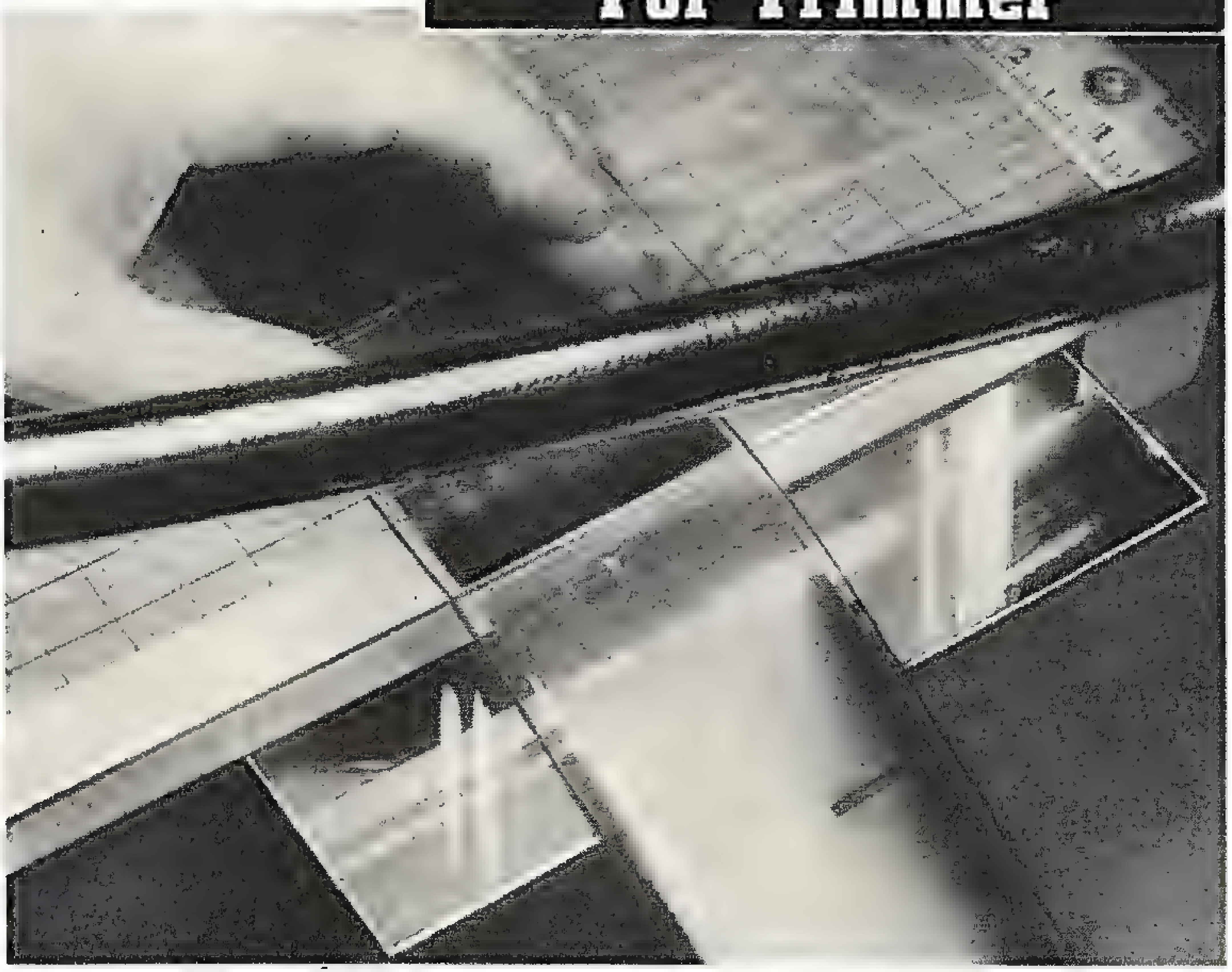
Faucet Strainer Aids Print Washing

Prints can be thoroughly washed in an ordinary tray by fitting the water faucet with a 5 cent strainer, which causes the water to fall in a uniform stream. Adjust the position of the tray so that the stream strikes the edge of the tray lip, and the prints will be kept apart by the circulating water.

Adhesive Finishes Hold-down Glass

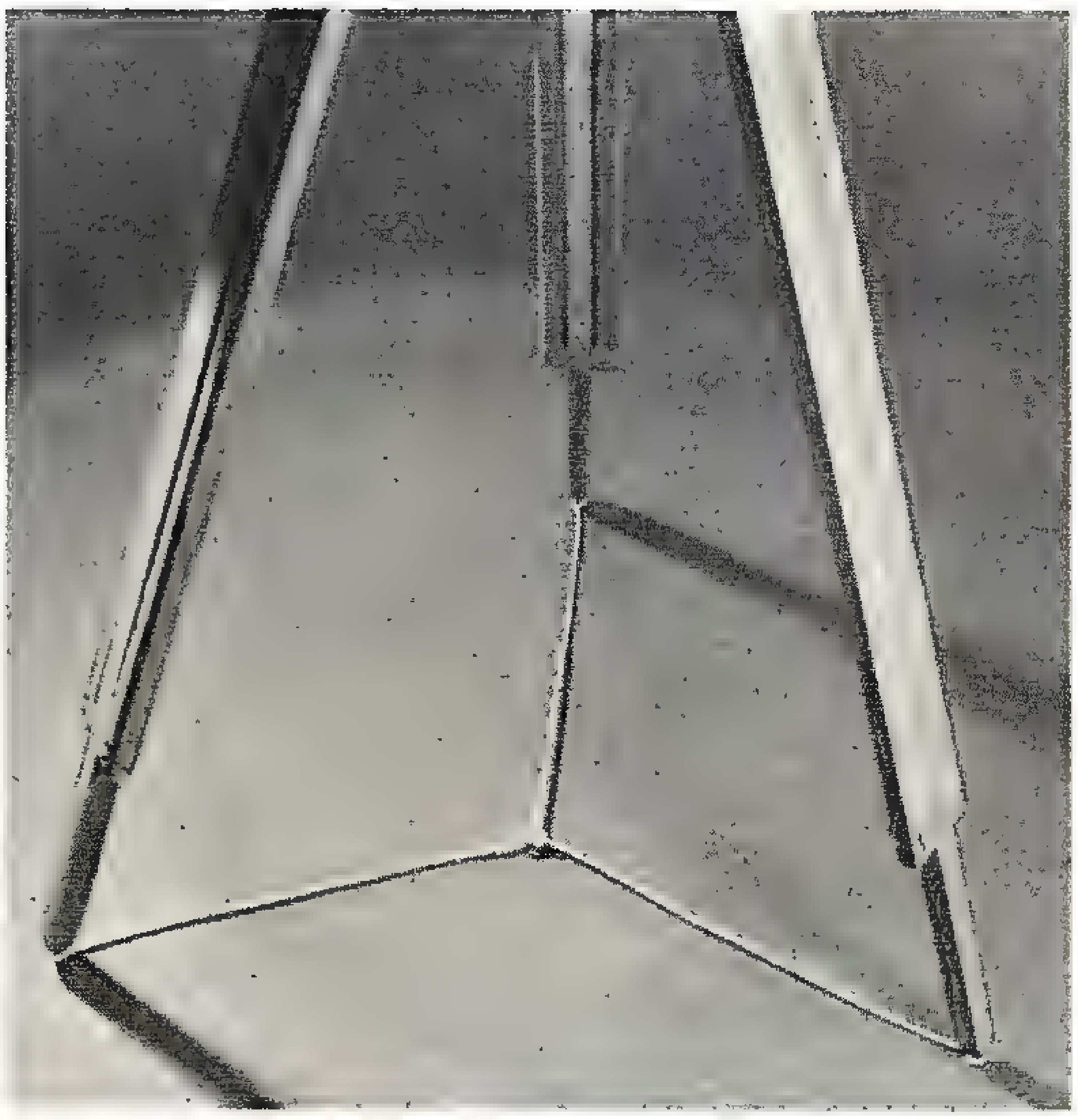
The sheet of glass used to hold down enlarging paper on the easel will be easier to handle if the edges are covered neatly with a strip of adhesive tape. Use tape wide enough to extend about one-quarter of an inch over each edge when it is folded.

Mirror Attachment For Trimmer

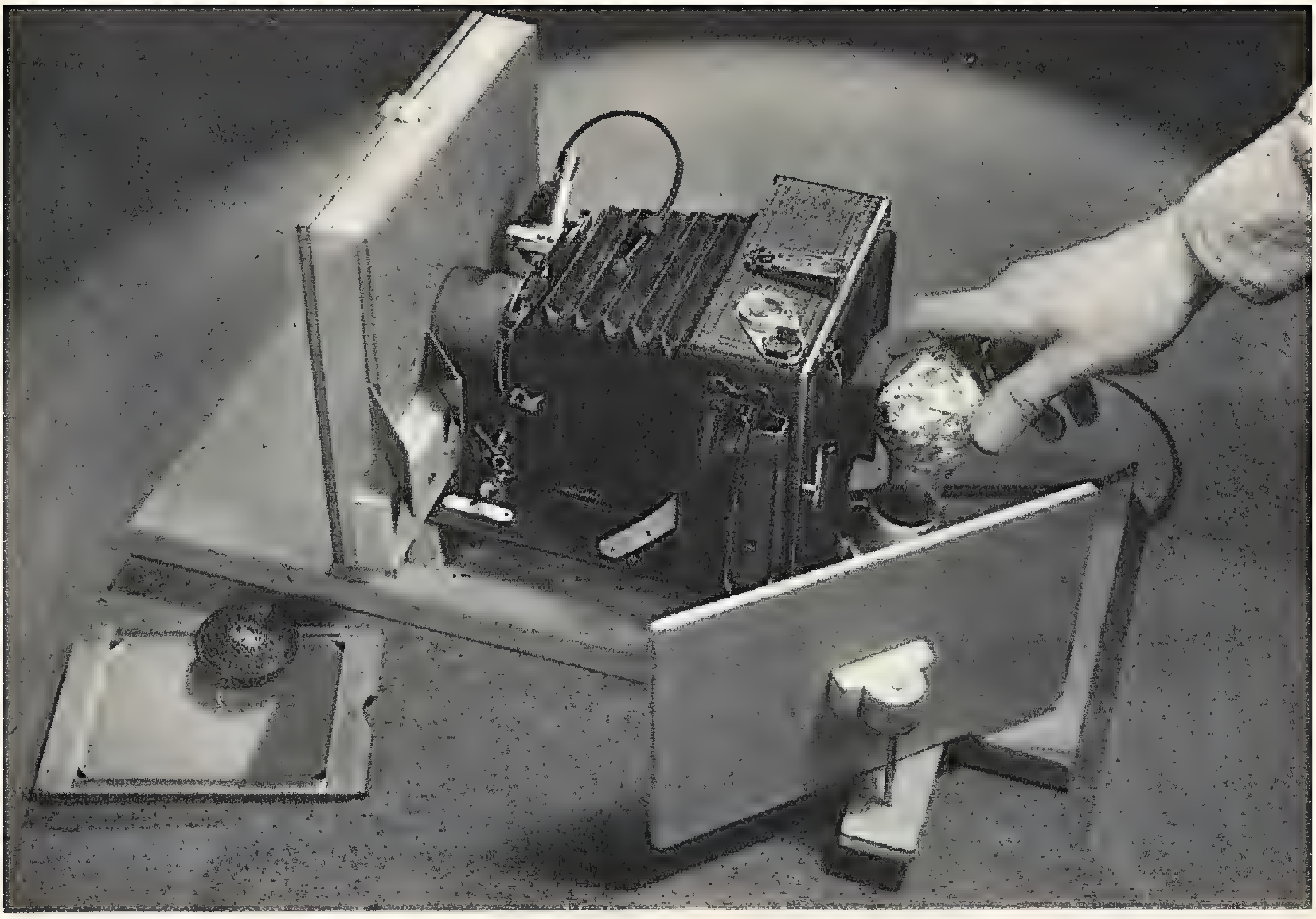


By mounting a small mirror to the base of a paper cutter, just below the blade, sufficient light will be reflected to the portion of the paper to be cut to assist materially in the operation. A long narrow strip of mirror will be found to be the most satisfactory shape. If the material to be cut is not too wide, a small pocket mirror can be placed on the table under the cutter. This size mirror will be large enough for films of the 35 mm. or slightly larger size.

Wires Hold Tripod

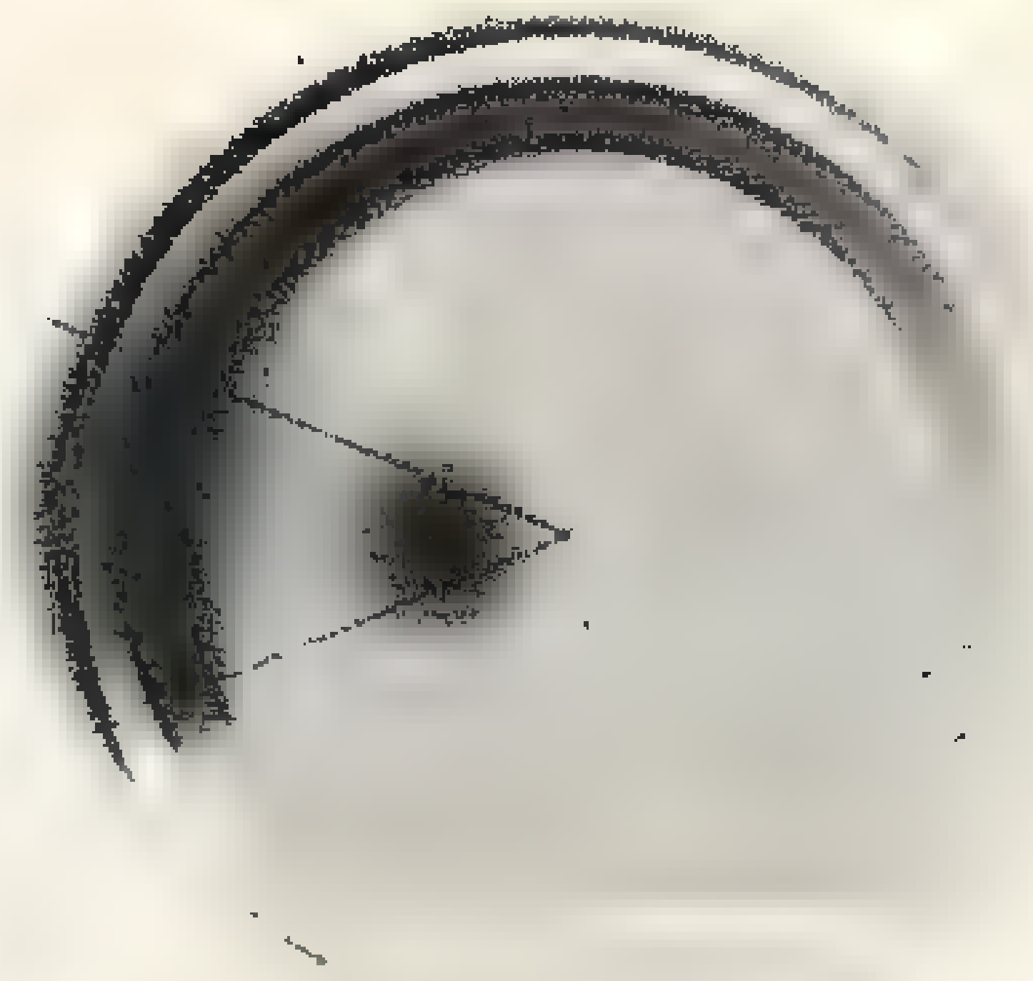


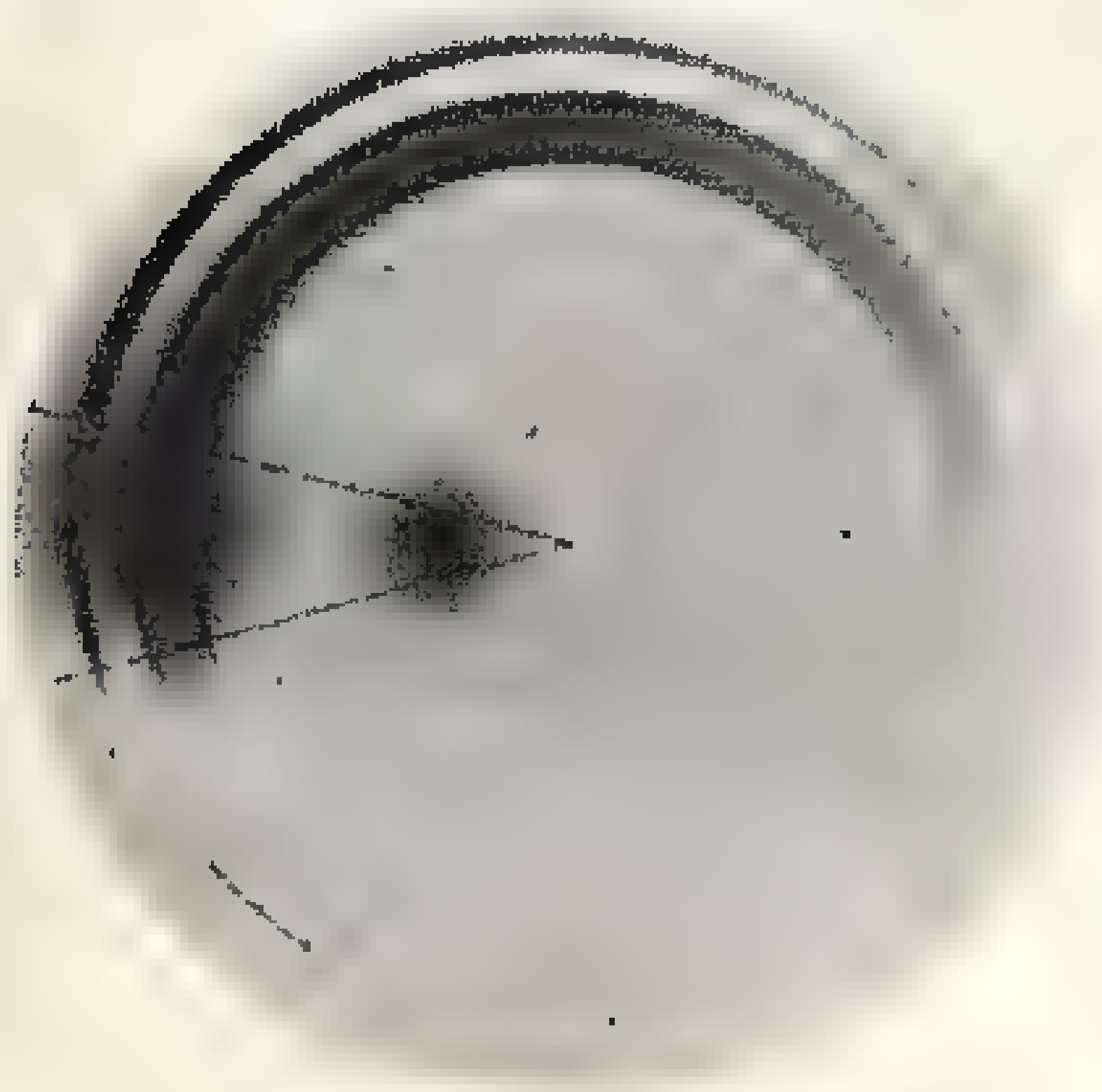
Cut three 15-inch lengths of galvanized wire and bend the ends into loops with one end of each fastened together. They can then be placed on the floor with the tripod legs resting in the outside loops, preventing them from slipping on any smooth surface. This simple device will do much to prevent accidental damage to a camera by having the tripod slip on a smooth floor. Also, the tripod can be moved easily over the floor with legs remaining in their respective positions.



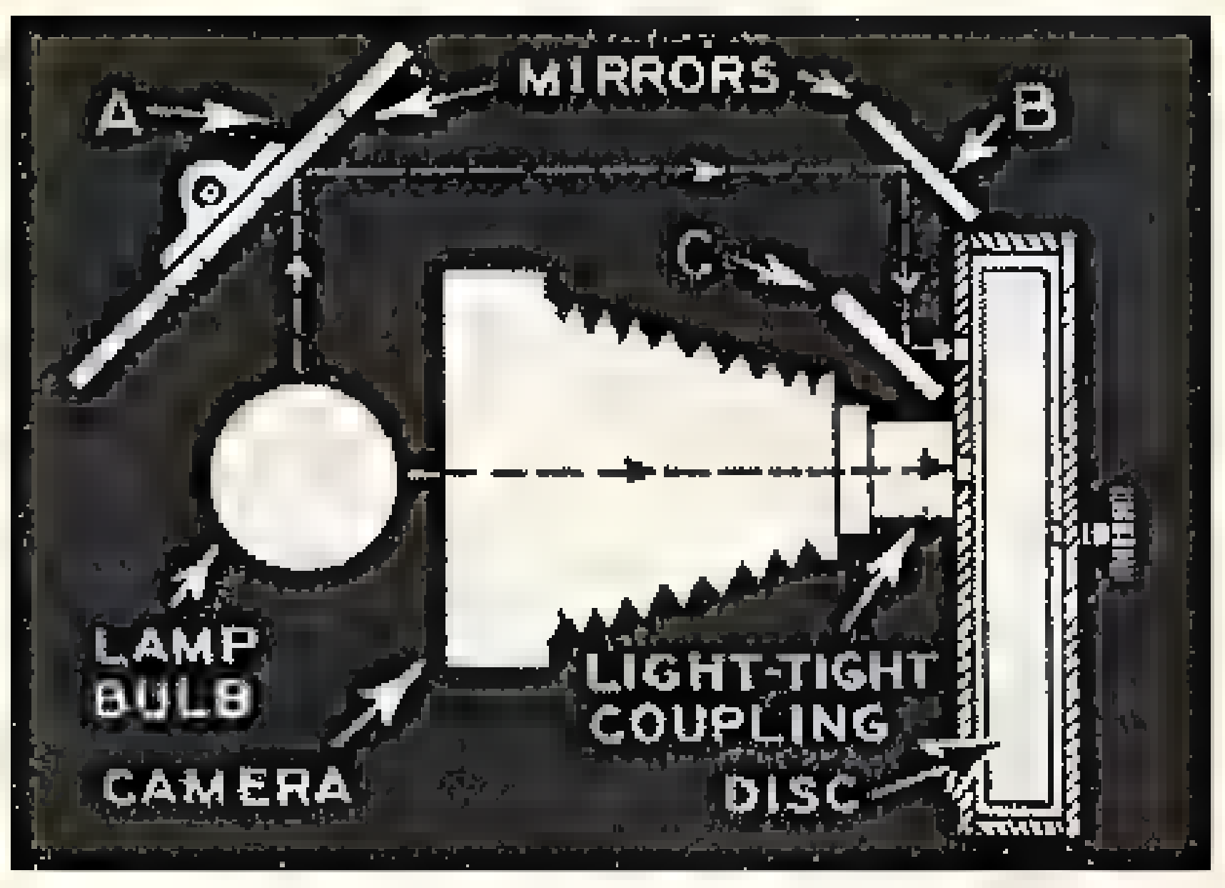
The completed tester from the mirror side. Note that large mirror, whose back is toward the camera, can be adjusted for angle. Back of camera has been removed.

Build Your Own Photoflash





Right: Specimen test disc, showing synchronization at 1/100 second shutter speed, with a small, wire-filled photoflash lamp. From the center outward are seen the shutter tracing, arc showing duration and variable intensity of the flashbulb output, and a third arc, made by two holes showing direction of rotation. Note broad peak of lamp output as indicated by dense region. The synchronizer is a trifle early in its operation, but still well on the peak. Left: Record of foil-filled lamp (small size), at 1/200 second. Note narrower peak as compared to record of wire-filled bulb.



Left: Arrows show direction of light through camera.

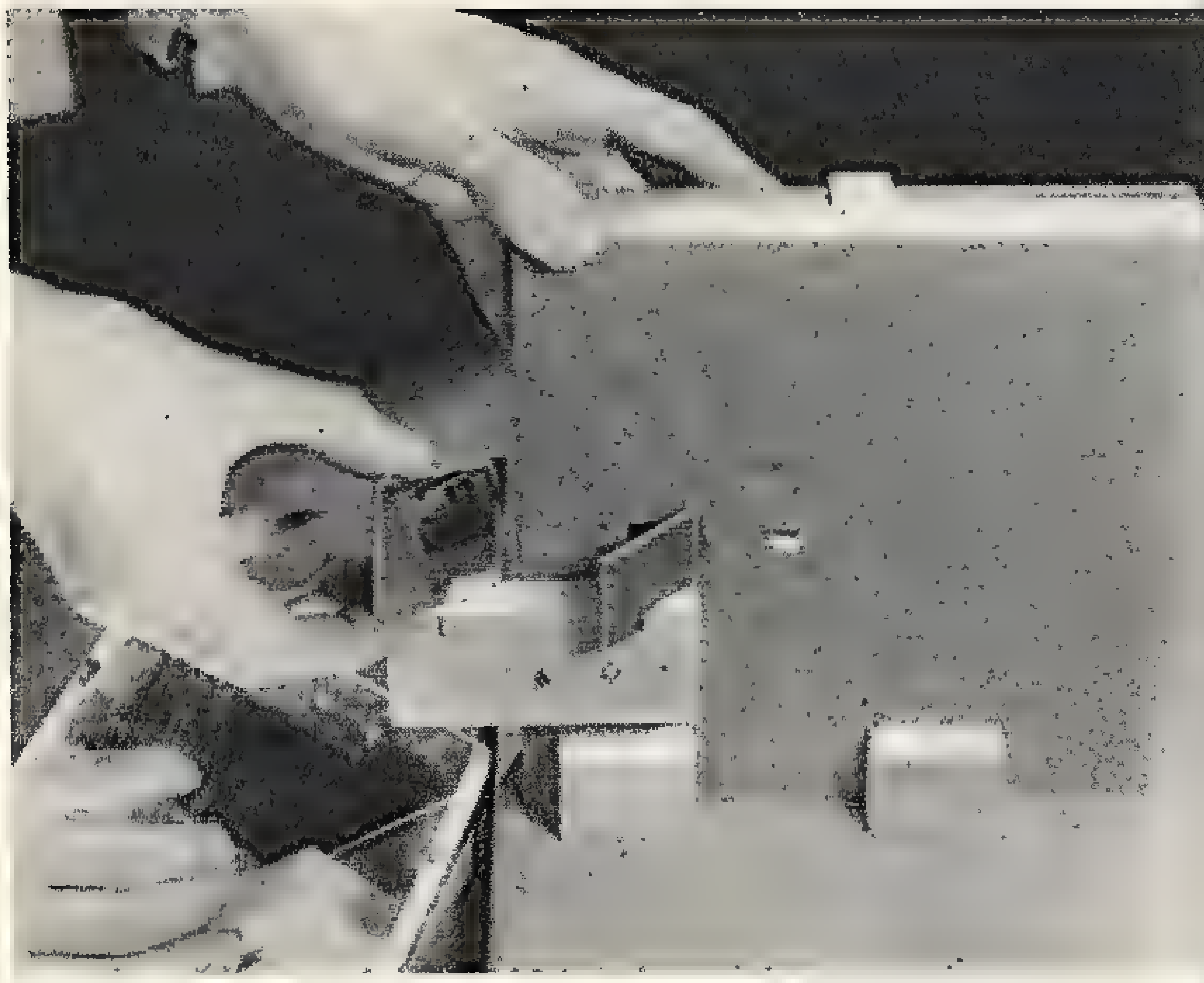
by Walter E. Burton

PHOTOFLASH synchronizers, increasing rapidly in popularity among amateur photographers as well as professionals, are mechanical devices for operating camera shutters in conjunction with photoflash lamps. For best results, the shutter should be open at the instant the photoflash lamp is burning at its greatest brilliancy. Usually the photographer has to trust to luck and the synchronizer manufacturer, and hope that his shutter is winking at the right time. But with a simple testing device, which anyone handy with tools can build for a few cents, the accuracy of synchronization can be checked with precision sufficient for ordinary purposes.

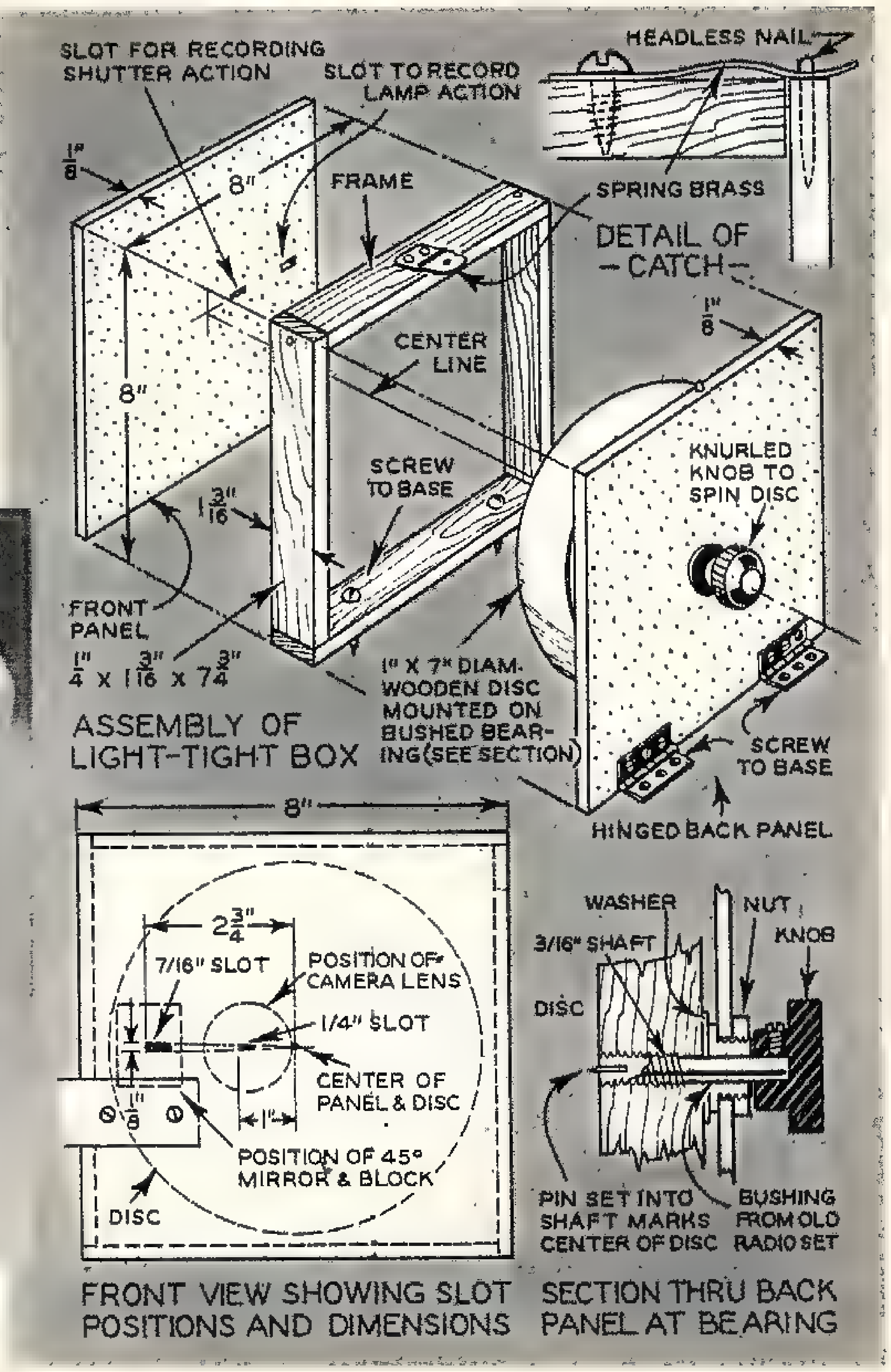
A photoflash lamp, although it seems to the eye to produce an instantaneous flash of light, really burns in a characteristic manner over a definite period of time. The foil or wire inside the bulb is ignited by the filament or starter, rapidly flares up to maximum brilliancy, and then

Synchronizer Tester

dies down and finally goes out. The entire flash may last but 1/50 second; and during that period the actual peak of light may last for only 1/200 second. The newer lamps are designed to produce a broad, even peak, to make synchronization more certain. The problem of synchronizer adjustment is to match the shutter and lamp actions so that the shutter will be open while the lamp is at the peak of light emission. Usually shutter speeds on the order of 1/100 and 1/200 second are employed, although much higher ones up to and beyond 1/1000 second can be used.

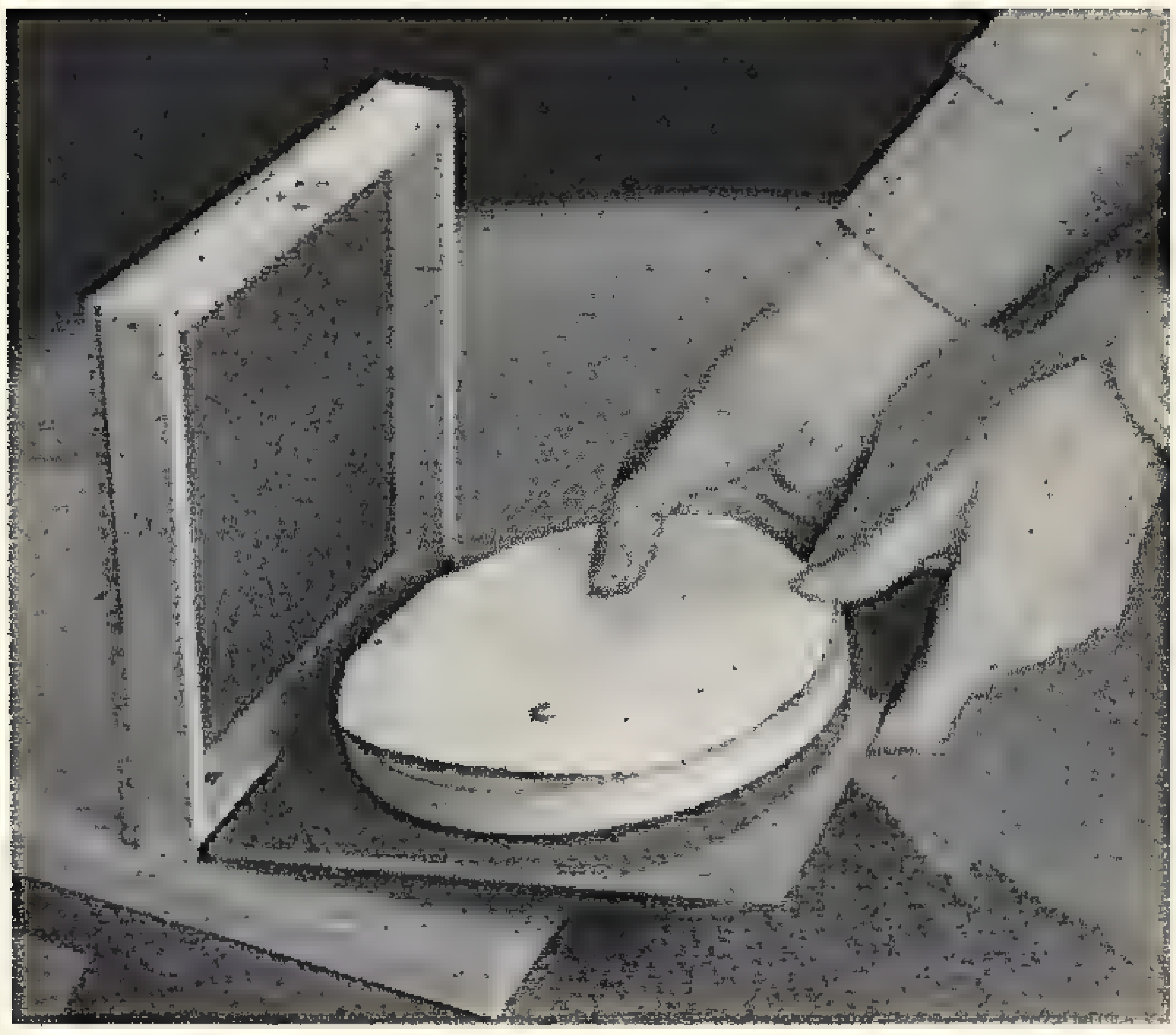


Light from the photoflash lamp is carried, by means of three mirrors, to the opening that traces the complete flash cycle on the rotating disc. The two small mirrors shown are set at angles of 45 degrees to the panel.

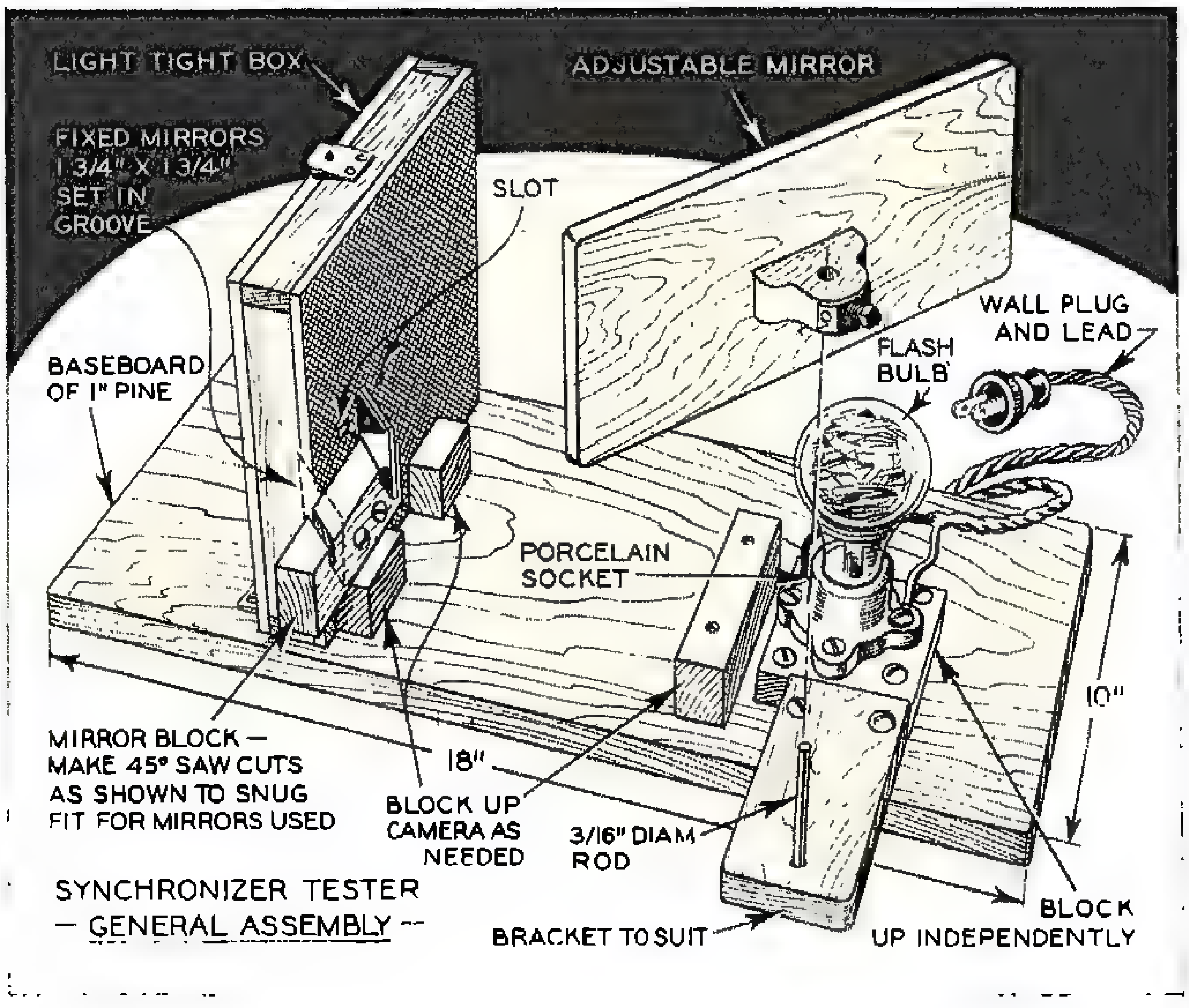

SLOT FOR RECORDING SHUTTER ACTION
SLOT TO RECORD LAMP ACTION
HEADLESS NAIL
SPRING BRASS
DETAIL OF - CATCH -
1/8"
8"
FRAME
CENTER LINE
8"
1 3/16"
SCREW TO BASE
KNURLED KNOB TO SPIN DISC
FRONT PANEL
1/4" x 1 3/16" x 7 3/4"
1" X 7" DIAM. WOODEN DISC MOUNTED ON BUSHED BEARING (SEE SECTION)
ASSEMBLY OF LIGHT-TIGHT BOX
SCREW TO BASE
HINGED BACK PANEL
8"
2 3/4"
7/16" SLOT
POSITION OF CAMERA LENS
1/4" SLOT
CENTER OF PANEL & DISC
1/8"
1"
POSITION OF 45° MIRROR & BLOCK
DISC
FRONT VIEW SHOWING SLOT POSITIONS AND DIMENSIONS
WASHER
NUT
KNOB
3/16" SHAFT
DISC
PIN SET INTO SHAFT MARKS CENTER OF DISC
BUSHING FROM OLD RADIO SET
SECTION THRU BACK PANEL AT BEARING

The tester illustrated by the photographs and drawings was designed primarily for use with cameras having between-the-lens shutters, the type usually employed with synchronizers.

Briefly, the operation of the tester is: A disc bearing a sheet of bromide enlarging paper is rotated inside a light-tight box. There are two holes in the box, one directly opposite the center of the lens whose shutter is being synchronized, and about 1 inch to one side of the center of the rotating disc. The second hole is about 1¾ inches farther from the center. A photoflash lamp is placed in a socket directly in line with the first hole and the lens and shutter. A system of mirrors, arranged somewhat like those in a periscope, carries light from the flashbulb into the second hole. Thus light from the lamp reaches the disc of sensitive paper through two holes, one by way of the mirrors,

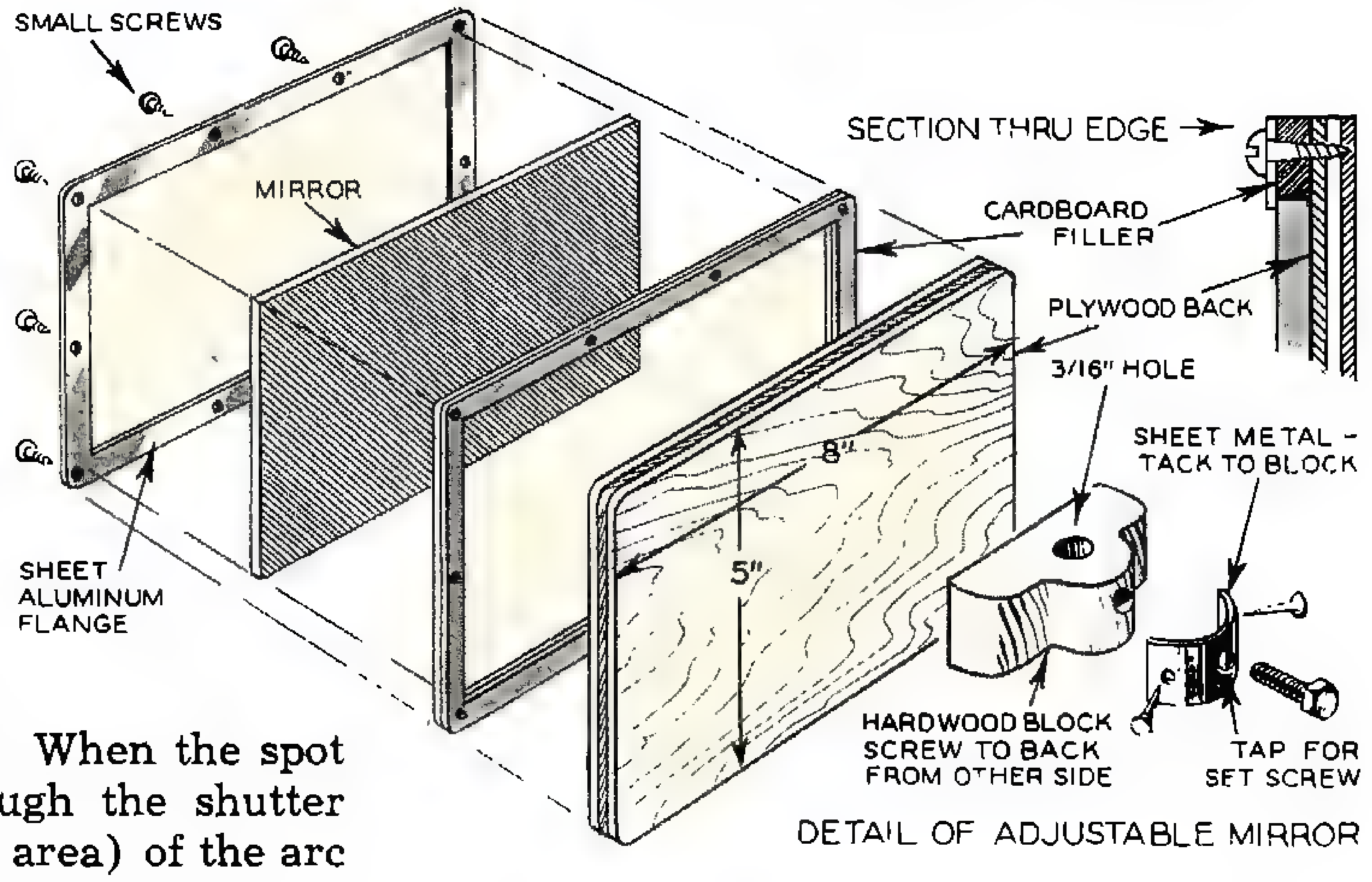


Thumbtacking a bromide paper record sheet to the wooden disc preparatory to making a test. This is done in the darkroom, by a suitable safelight lamp.


LIGHT TIGHT BOX
ADJUSTABLE MIRROR
FIXED MIRRORS 1 3/4" X 1 3/4" SET IN GROOVE
SLOT
WALL PLUG AND LEAD
FLASH BULB
BASEBOARD OF 1" PINE
PORCELAIN SOCKET
10"
MIRROR BLOCK — MAKE 45° SAW CUTS AS SHOWN TO SNUG FIT FOR MIRRORS USED
18"
BLOCK UP CAMERA AS NEEDED
3/16" DIAM ROD
BLOCK UP INDEPENDENTLY
BRACKET TO SUIT

SYNCHRONIZER TESTER — GENERAL ASSEMBLY —

and the other through the camera shutter. To make a test, the disc is started spinning by means of a knob on its shaft, and the synchronizer is operated to fire the lamp and release the shutter. The light traces two arcs on the spinning bromide paper disc. One shows the light output of the lamp from beginning to end, while the other shows the shutter operation. When the spot made by light passing through the shutter is opposite the peak (darkest area) of the arc traced by the open lamp, synchronization is perfect.


SMALL SCREWS
MIRROR
SECTION THRU EDGE
CARDBOARD FILLER
PLYWOOD BACK
3/16" HOLE
SHEET METAL - TACK TO BLOCK
8"
5"
SHEET ALUMINUM FLANGE
HARDWOOD BLOCK SCREW TO BACK FROM OTHER SIDE
TAP FOR SET SCREW

DETAIL OF ADJUSTABLE MIRROR

Obtain, for a base, a piece of pine or redwood measuring about 1x10x18 inches. From the same kind of wood cut a disc about 7 inches in diameter. Make a shallow box, in which the disc is to rotate, with inside dimensions something on the order of $1\frac{3}{16}$x8x8 inches, just enough to allow the disc to operate freely when the sheet of bromide paper, anchored with thumb tacks, is in place. To make the box, cut two 8-inch squares of thin material such as ⅛-inch presdwood or sheet metal, and four strips ¼x$1\frac{3}{16}$x7¾ inches. Assemble the strips to form a frame, with corners butted. In one of the square sides, cut two holes or slots, as shown. Note that these are tapering in shape, two of their edges being determined by radii drawn from the center of the square. In the exact center of the second square piece, mount a bushing or bearing to receive a $\frac{3}{16}$-inch or similar small-sized shaft. Mount the disc on one end of this shaft, and a knurled radio knob on the other end. The shaft is about 1½ inches long overall. A good way to mount the disc is to thread one end of the shaft and screw it into a hole drilled in the center.

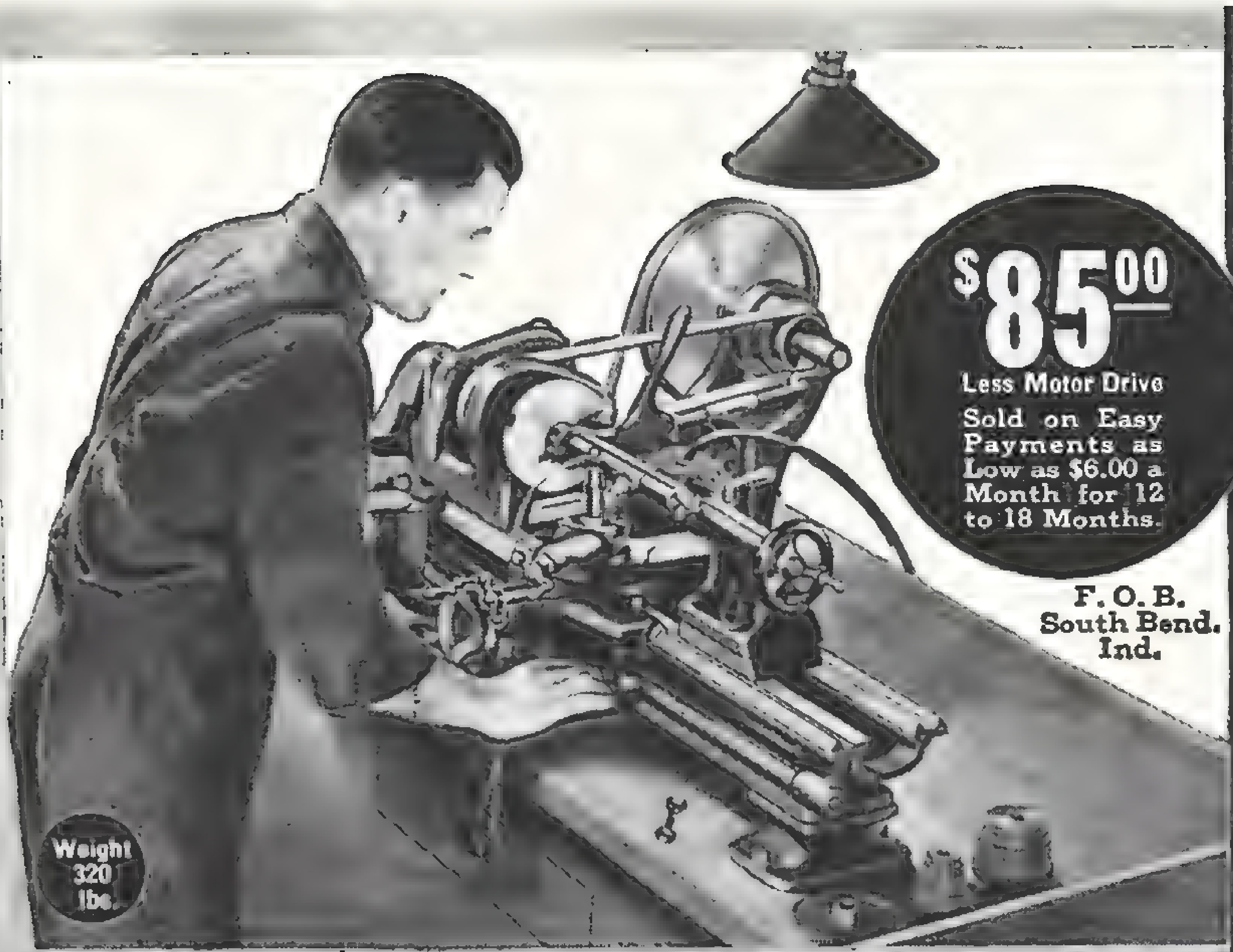
The disc should rotate freely when the knob is given a twist and released. Center of the disc (shaft) should be opposite the center point of the side in which the two slits are cut. To mark the center of the paper disc for later reference, drill a small hole in the end of the shaft, centering it as accurately as possible, and drive a brad into it. Cut the brad off and file it to a point that projects a small fraction of an inch above the surface of the disc.

Mount the panel carrying the rotatable disc, by means of two small butt hinges at the lower edge, and provide a catch at the top. This permits the disc to be moved outward for placing and removing the bromide paper.

By means of blocks, arrange the camera whose shutter is to be tested so that the center of the lens is directly opposite the slit nearer the center of the disc. If the lens cannot be pushed snugly against the panel, use a tube of cardboard or rubber to make a light-tight connection, so that outside light will not leak in.

Directly behind the camera, on a line with

[*Continued on page* 137]



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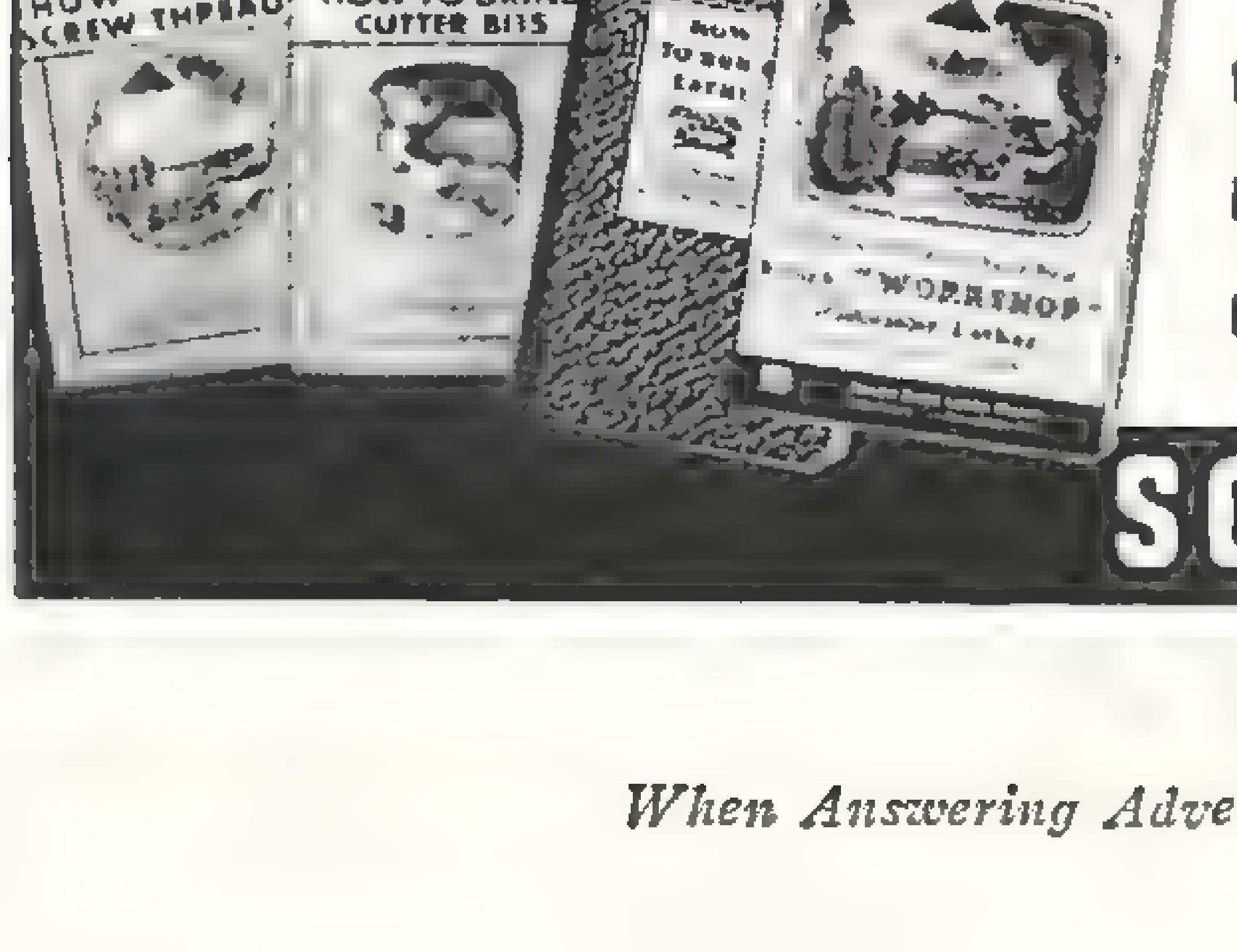

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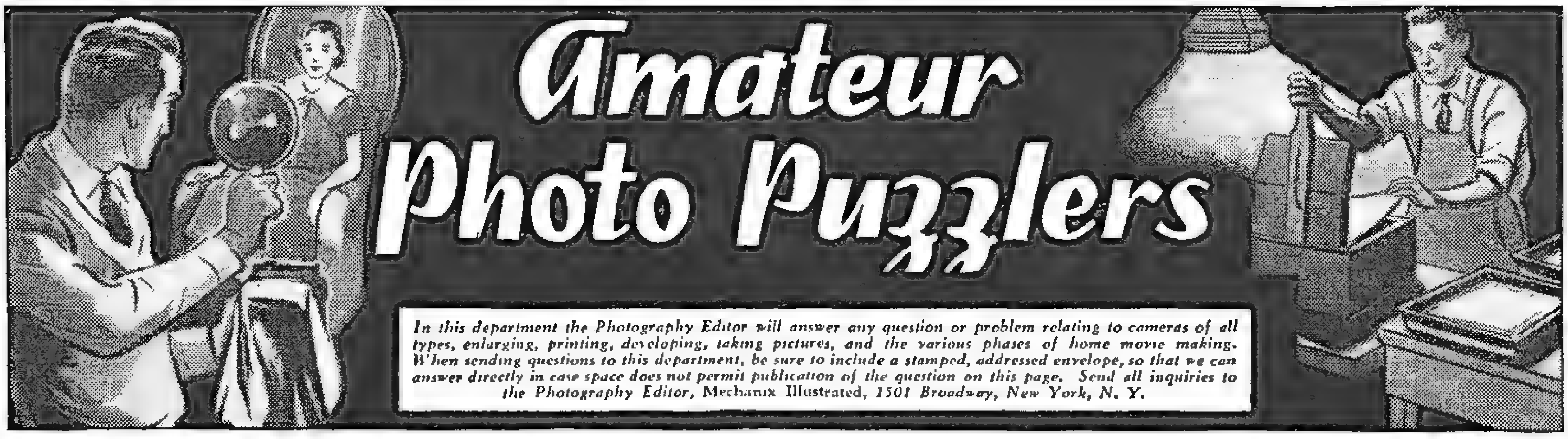

Amateur Photo Puzzlers

In this department the Photography Editor will answer any question or problem relating to cameras of all types, enlarging, printing, developing, taking pictures, and the various phases of home movie making. When sending questions to this department, be sure to include a stamped, addressed envelope, so that we can answer directly in case space does not permit publication of the question on this page. Send all inquiries to the Photography Editor, Mechanix Illustrated, *1501 Broadway, New York, N. Y.*

SPEED-UP PROCESSING

Q. I heard that professional photographers speed up the processing of film by washing it in an alcohol bath. How is this done?—R. B. Reynolds, Princeton, W. Va.

A. Speeding-up the processing of film is best done by developing in normal strength developer, as double strength developer is very tricky to handle. Then the film may be fixed in double strength hypo, if desired, for at least 10 minutes, and washed in running water for at least 20 minutes. This does not actually speed processing, but assures complete hardening of the emulsion. After the film has been properly developed, fixed and washed, it may be dipped in an alcohol bath. Ordinary rubbing alcohol may be used and all that is required is that the film be dipped and instantly removed from the bath and hung up to dry. This will speed-up the drying process.

Another method used by professionals for hurry-up printing of wet film is to dip the film in glycerine and project it in the enlarger while it is still wet. This method speeds up the printing, but the glycerine messes up the enlarger and the operator has the task of later removing the glycerine. An article explaining how to overcome this difficulty with the wet-cell process appears in the Photography Handbook No. 2. This publication will be available October 5.

SKETCH PRINTING

Q. I have heard of a process of printing called "sketch printing with a negative" in which exposures of several minutes are given. What is this process?—E. M. Gannon, Bloomfield, N. J.

A. Judging from the exposure time mentioned, it seems apparent that some material was used to make a pattern upon the print. This could be a piece of silk, linen or window screen on a stretcher form supported between the negative and the paper during exposure. If such a screen is held about one inch above bromide paper on which the negative image is projected, the result will give the effect of a sketch print. The principle here is simply that the screen will vary the quality of the surface and make the resulting print look like a sketch, depending, of course, on the size of the screen used.

CHROMATIC ABERRATION

Q. What causes chromatic aberration?—L. McGeoghegan, Beverly, Mass.

A. A lens that is non-corrected, or non-achromatic, produces an effect referred to as chromatic aberration which is a condition of non-coincidence of the fiscal and chemical foci. What happens is that light passing through a prism or a lens is broken up or refracted into its constituent rays. If a beam of light strikes a lens, it is refracted and dispersed and as the violet rays are bent out of their course more than the red, the violet rays will form again on the other side of the lens at a point nearer the lens than the red rays. Now the brightest part of the spectrum to the human eye is in the yellow, while the rays which act most on film are the blue and violet. If we obtain an image in the yellow rays, the film would be affected by the blue and violet rays and the picture would not be sharp.

CM. MARKINGS

Q. What are the cm. markings on a lens barrel?—L. M. Rose, Kalamazoo, Mich.

A. The "cm." marking on your lens barrel refers to "centimeters," and indicates the focal length of the lens. Two and one-half cm. approximates 1 inch focal length. If the marking on a lens barrel reads 10 cm., that means the focal length of the lens is approximately 4 inches.

DETERMINING FOCAL LENGTH

Q. What is a simple method of determining the focal length of any lens?—C. M. Hogarth, Quebec, Canada.

A. Focal length is easily determined by removing the lens from the camera and focusing an object that is infinity distance away from the lens onto a sheet of white paper held behind the lens. The distance between the sharp image on the paper to the lens is the focal length.

PIN HOLES

Q. My negatives have pin holes. What causes them?—R. L. Griffin, Hamlet, N. C.

A. Pinholes are due to such causes, as the failure to use an acetic acid short-stop bath between the developing and fixing of the film. It may also be due to marked changes in temperature between the developer, fixing bath and washing water. To prevent pin holes, take care that processing is done with all solutions and the wash water at as near the same temperature as possible. Also, the film should be dipped in a short-stop bath when changing from developer to fixing or, at least, washed momentarily in water when changing from developer to the fixing trays.

RENOVATING BELLOWS

Q. The bellows of my camera have a slight light leak. Is there any kind of tape or compound that I could use to prevent light leaks?—L. L. Sturges, West Des Moines, Iowa.

A. The bellows, or folding portion of the camera between the lens unit and film unit, is usually constructed of leather, rubber compound or black cloth. Black sticking plaster (such as black adhesive tape) is useful in repairing slight light leaks in bellows. The following is recommended for renovating leather bellows and leather camera coverings generally:

Sperm oil	3 ozs.
Acetic acid	3 drams
Glycerine	3 drams
Oil of turpentine	½ oz.
Water to	15 ozs.

Add the mixture slowly to the white of 3 eggs, using an egg beater and then add 3 ozs. of methylated spirit and about 100 grains of aniline black dye.

A reviver for cloth bellows may be made as follows:

Methylated spirit	16 ozs
Shellac	4 ozs.
Oxalic acid	½ oz.

Shake until dissolved and then add 3 ozs. of linseed oil. If the bellows are black give it a preliminary coating of India ink dissolved in water, and a trace of Prussian blue to kill the brownness. When dry, apply the reviver, using a pad of cotton-wool, and finally removing the surplus by brisk rubbing.

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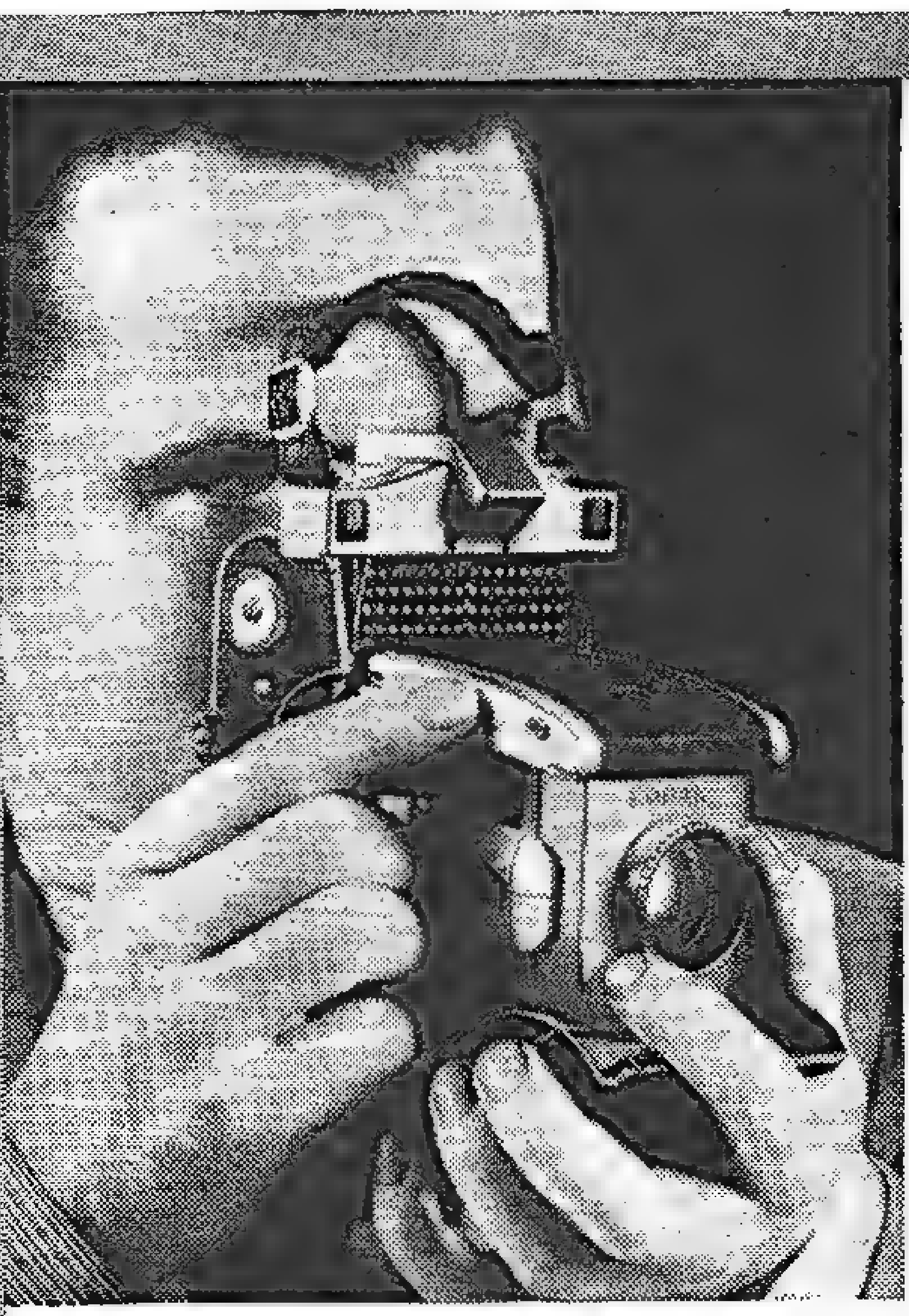
The editors of MECHANIX ILLUSTRATED distribute $40 in cash awards each month to the five persons who, in their opinion, submit the best pictures suitable for publication in the MECHANIX ILLUSTRATED Photography section. Full particulars regarding these awards will be found in this issue on page 119.



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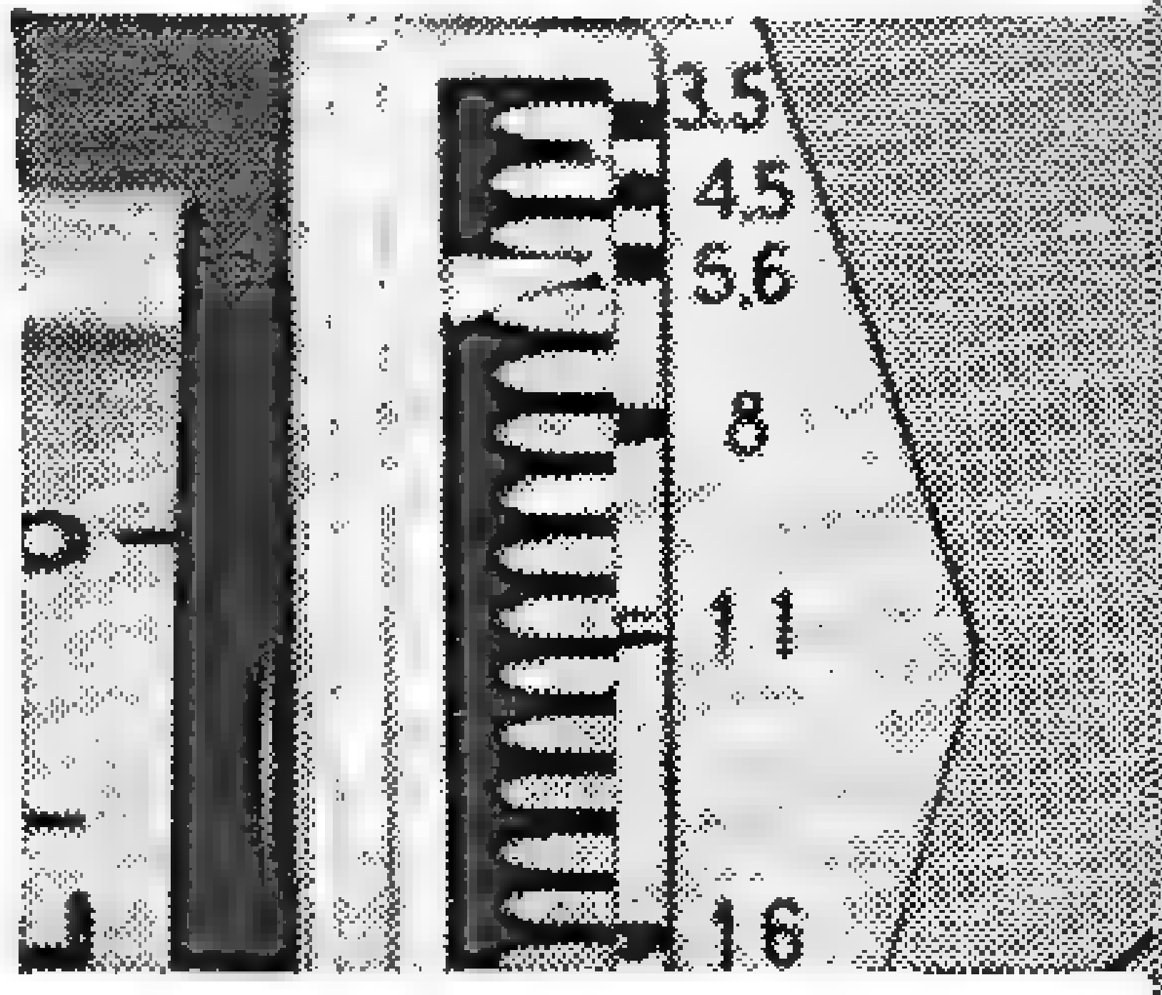

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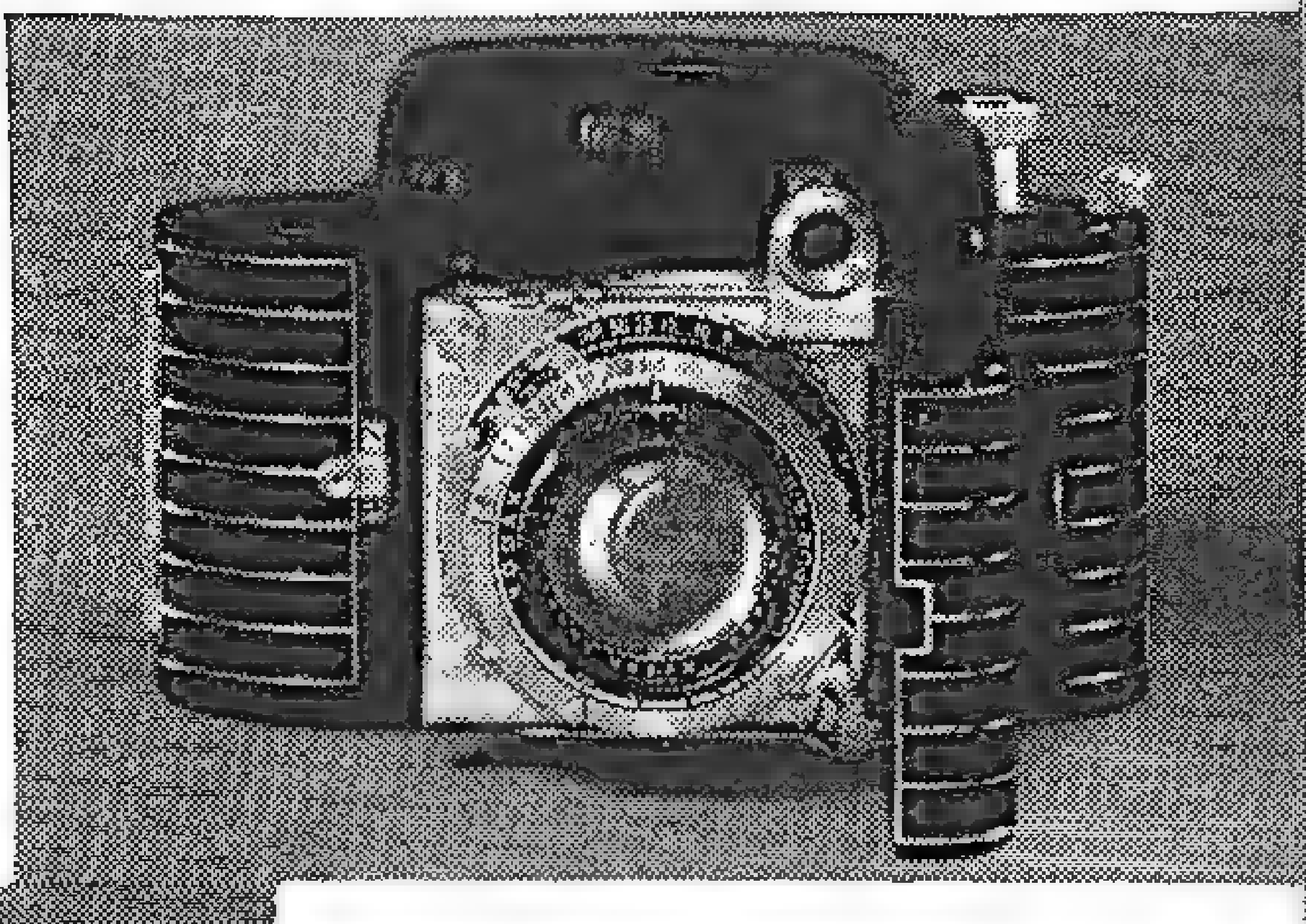

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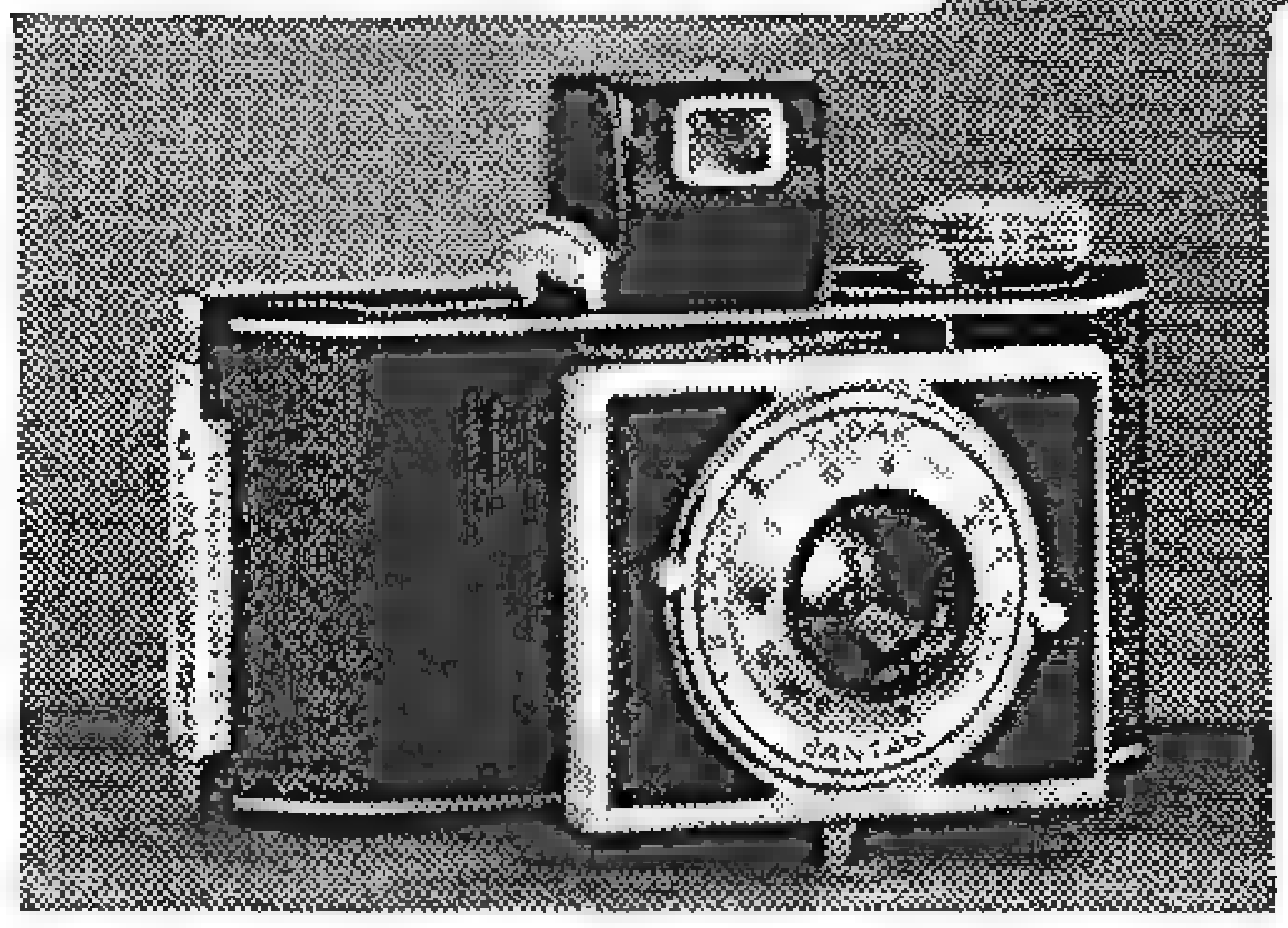

NEW KODAK BANTAM (*f*.5.6)

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A Handsome "Prop" Clock

[*Continued from page* 115]

the worm and the fluke with a small chisel. When this is accomplished, glue the pieces together, using hot glue, and allow the assembly to set thoroughly.

Next cut out the base pieces as shown in Fig. 7, and glue these together. Now lay out the stem pieces. On the bottom stem piece lay out the approximate contour of the base pieces. Cut this out first and then saw out the stem pieces as shown. Then glue them together.

Back to the propeller block itself, clamp this in a vise protecting the wood with thin pieces of wood over the jaws of the vise. Using a draw-knife cut the blades of the propeller as shown in Fig. 5. The blades may easily be kept sufficiently accurate by watching the curves of the different colored woods. The shape of the blade in section is shown in Fig. 7, and when these are approximated, begin with a wood scraper and smooth the prop carefully over-all. During the carving process a wood rasp will greatly facilitate the work. Now sand with progressive grades of sandpaper until smooth. Then give it a coat of orange shellac. This coat will reveal any places that need further sanding. Drill two holes on the centerline into the hub. Then drill the holes for the stem of a small electric clock and also for the hour indicating buttons which are chromium plated, self-piercing paper fasteners. Two more coats of shellac sanding each coat, and a coat of dull varnish complete the finish of the prop.

Building Bottled Boats

[*Continued from page* 89]

By the time this is done, the hull is dry. Drop it in and go after it with the upholstery needle. Press it firmly into the clay, tilting the bow up and forcing the stern down a little. This will give the ship that slightly rakish look of a boat under sail. Do not, however, tip it to the leeward yet.

Now for the masts. Take two splints of bamboo of about equal length, shave them down and taper them off at the peak. Once in the boat they should come almost to the top of the bottle.

The sails are next. Take the writing paper and scissors and cut two fore and aft sails as shown in Fig. 1., taking care not to make them too large. Then chop off two shorter bamboo sticks to serve as booms and four still shorter ones for gaffs. Run glue liberally along the mainmast, the after one. Pick up the sail and stick it into place. Set it aside and do the same to the other mast.

As soon as the glue has hardened and the sail is fast on the mainmast, take it in the tweezers and slip it into the bottle, sail and all, stepping it in its proper hole. The slight roll given to the sail as it passes through the bottle neck creates the bellied effect of a sail under wind. The self-explanatory sketches provide rigging details.

Stamps As Propaganda

[*Continued from page* 86]

Russia and other nations have done the same thing in the past.

Symbols play a very forward part in the designs of stamps. Hence Italy will show the faces representative of modern Fascism and ancient Rome. Soviet Russia depicts on innumerable stamps, its communist emblem of scythe and hammer.

Portraits and likenesses of heroes and heroines play a large part in stamp illustrations. In 1932, when Italy celebrated the first decade of the Fasciest regime, under Benito Mussolini, a long series was produced. It bore such designs as that of Mussolini himself, as well as of a royal statue in Rome. Of greater importance than these likenesses are the inscriptions, or mottoes, found on each value of this stamp series. "If I advance, follow me," appears upon one. These mottoes are written in Latin, and they have a particular and pointed meaning, tie up with the designs, and aim to spread the doctrine and the meaning of Fascism as advanced and preached by Il Duce.

Thus we can plainly and readily observe the reason for the postage stamp deluge each year—1937 saw over two thousand new stamps added to the many thousands already in existence. And 1938 is not, to date, lagging behind in production of still further issues. Soviet airmen conquer the North Pole—by flying over it, as well as establishing Arctic bases—and the Moscow government issues special postage stamps commemorating their feat. Instances such as these can be multiplied ceaselessly, evidence that postage stamps are propaganda.

Illuminated Wall Aquarium

[*Continued from page* 87]

The aquarium itself is made by bending ¾" hammered copper strips to form angles ⅜" wide. These strips are mitred or soldered to form a box frame 5½"x5"x3". Pieces of ordinary window glass are then cut to fit the bottom and three sides of the frame, and a piece of mirror is cut to fit the back. The glass is inserted into the copper framework and securely sealed into place with aquarium cement. As an added precaution, "ears" or flaps fastened to the copper strips at the top of the aquarium should be folded firmly over the glass.

After the cement has been allowed to dry, the aquarium should be filled with water, a few rocks and water plants added, and the light turned on until the water is warmed. The aquarium will then be ready for the fish.

In an earthquake on the Northwest coast, last year, some tombstones in cemeteries were turned clockwise, but a few nearby were rotated in the opposite direction.

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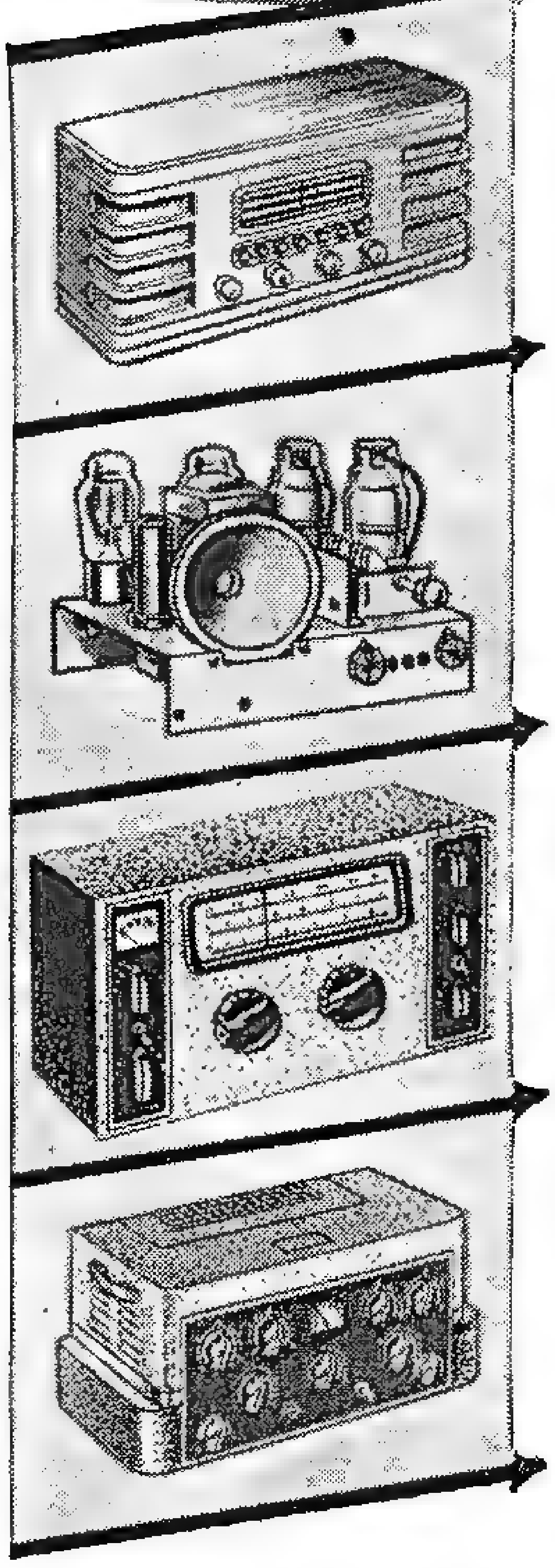

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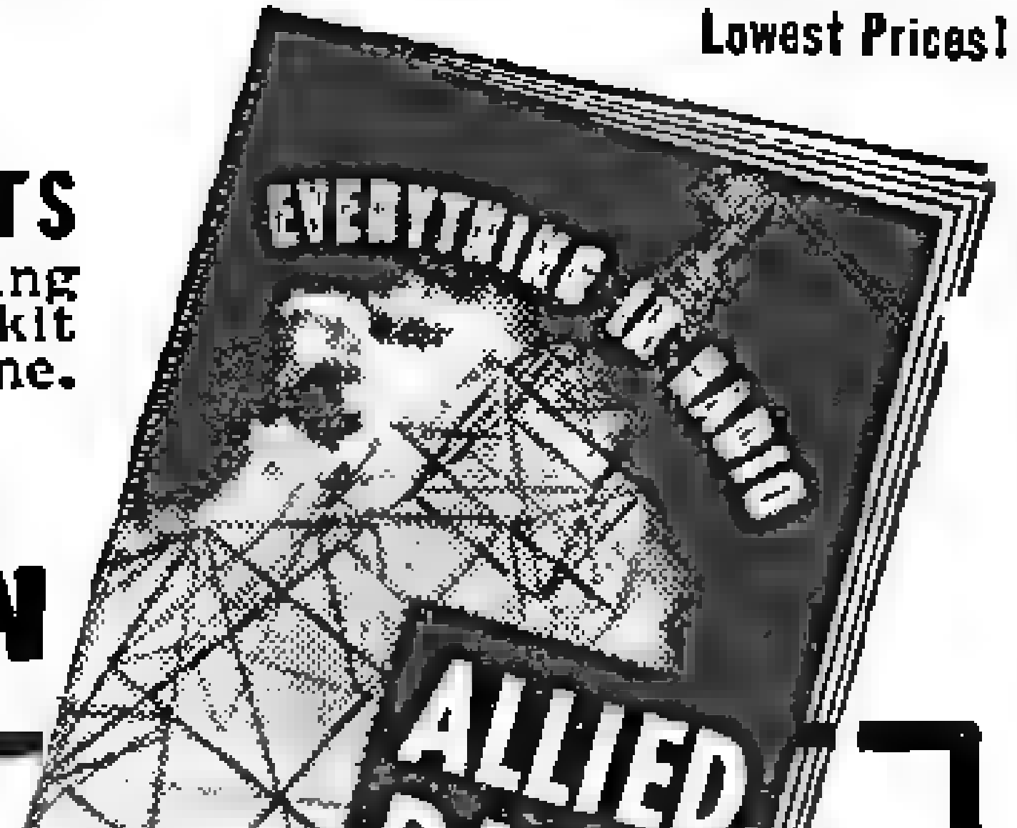

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Tricks With Paint-Spray Gun

[*Continued from page* 108]

A board in the shop on which are hung various small tools, can be marked so that the place for each tool is clearly outlined by its "shadow." This is done by hanging the tools on their pegs, and spraying the board, tools and all, with lacquer of an appropriate color. Then wash the lacquer off the tools with thinner. Perhaps a preliminary coating of oil on the tools will make the washing easier, because lacquer does not dry well over oil or greese. Then, whenever a tool is removed from the rack, its outline will show plainly on the board.

Another type of "shadow spraying" is accomplished by setting small lengths of circular rod or other similar object on end on the surface being painted, and directing the spray upon it from a more or less fixed direction. The area in contact will not receive any color, while that on the side opposite the spray gun will be only lightly sprayed—reproducing as a "shadow." The best effect is produced by having a dark background and using a light-colored lacquer for the second coat. The shadows then will be dark. Rows of objects, like the teeth of a comb, can be used to produce interesting designs in this way.

Effectiveness of many jobs of painting depends on artistic borders. It is surprising how many common objects can be pressed into service as border stencils. A length of chain such as that used on furnace regulators or for leading dogs will, when stretched across a surface being sprayed, produce a striking "shadow" border. The base coat should be of the color desired for the border.

Build The M I Testmaster

[*Continued from page* 101]

sensitivity of the meter is employed on both these ranges, so no large external batteries are required and the instrument is completely self-contained. A carefully-designed compensating circuit provides for accurate zero adjustment and keeps the instrument accurate even when the batteries drop in voltage.

The voltage ranges provided are 15, 75, 150, 750 and 3,000 volts. These ranges provide a good overlap so all readings will appear well up on the scale.

Referring to the schematic diagram, it is seen that the meter is connected for either resistance or voltage measurements by throwing the single-pole double-throw toggle switch, SW1, to the proper position. With SW1 set for "volts," the double-throw, double-pole toggle switch, SW2, may then be set for either a. c. or d. c. readings. For d. c. the current drain from the circuit under test is 1 milliampere for full-scale deflection on any range. Since the meter requires but .4 milliampere, the balance is required by the shunt

[*Continued on page* 146]

Build Your Photoflash Tester

[*Continued from page* 130]

the center of the lens and the slot, mount a porcelain socket for the flashlamp, blocking it up if necessary to attain the proper alignment.

Three mirrors are used to direct light from the lamp into the slot farther away from the center of the disc. Two of these are small, measuring about 1¾ inches square if space between camera and box will permit. They are held, like the mirrors of a periscope, in 45-degree saw slots cut in a block of wood screwed to the front panel of the box as shown. The third mirror is larger than the first two, and is mounted directly to one side of the lamp socket.

When ready to make a test, connect the synchronizer to the camera in the usual manner, and screw a plug, to receive the pronged connection on the tester wire, into the socket in place of the photoflash lamp; and place the lamp in the porcelain socket of the tester. Swing the hinged door bearing the wooden disc downward, and look through the slit farther from the center of the fixed panel. Adjust the movable mirror until you can see the image of the photoflash lamp clearly.

By the illumination of a suitable safelight lamp, cut a disc of bromide paper to fit the wooden disc of the tester, and fasten it in position with two thumb tacks so placed that they will not come opposite either of the slots in the fixed panel. Press the center of the paper disc so that the pointed pin punches through. Close the door, and spin the disc to see that it works.

Now give the disc a vigorous spin, and while it is rotating smoothly, fire the synchronizer. Remove the paper disc and develop and fix it as you would any print on the same kind of paper. When the disc has been washed and dried, you can draw radii from the center punch mark outward, to indicate the degree of alignment of the shutter arc with the peak of the lamp output.

Seeing Things At Night

[*Continued from page* 121]

as a floodlighted building for 30 seconds with a lens opening of f-6.3. A moonlight scene might take several minutes, while a brightly lighted house or factory building would probably turn out well with about a minute exposure.

5. Avoid the wrong kind of lights. You can't take a picture of a striking statue in the park if there's a glaring street light shining right into your lens. If necessary, use a lens shade. If a car passes during a long exposure you are very likely to get white streaks across your picture, caused by the headlights. You can hold your hat or your hand in front of the lens while the car passes and then remove it after the disturbing light has passed.

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Diatom Slides For Microscope

[*Continued from page* 91]

shells and seaweeds. Living freshwater diatoms are placed in a jar of water after they are strained through coarse muslin to remove large stones or particles. Let the mixture stand for a few hours to permit the sediment to settle, then place under a tap and allow a very gentle, preferably drop-by-drop stream to fall into the jar for twelve hours or overnight, after which the contents should appear as perfectly clear water with a layer of fine sediment on the bottom.

Next stand the jar in daylight for six hours, whereupon the diatoms will collect on the surface of the sediment as a rich brown film, which is then removed with a pipette and placed in a preserving fluid, such as five percent formalin or eighty percent alcohol to await cleaning. If prefered, they can be cleaned at once without preservation.

Marine diatoms are collected at low tide by lifting from shallow pools entire specimens of various algae (seaweeds) of green, brown and red varieties, avoiding larger types and those with a coating of mucus, as well as dead specimens cast upon the shore. Dry these plants in the sun, then place in a box for transporting home. Scrape piles of piers, shells, stones and skim the bottom surface of shallow pools which are sheltered from storms. After drying in the sun, add all of these scrapings to the dried seaweed collection. Plankton towings should be bottled.

Cleaning is the most important step in preparing diatom slides. All living diatoms, marine or freshwater, maybe cleaned by the following steps:

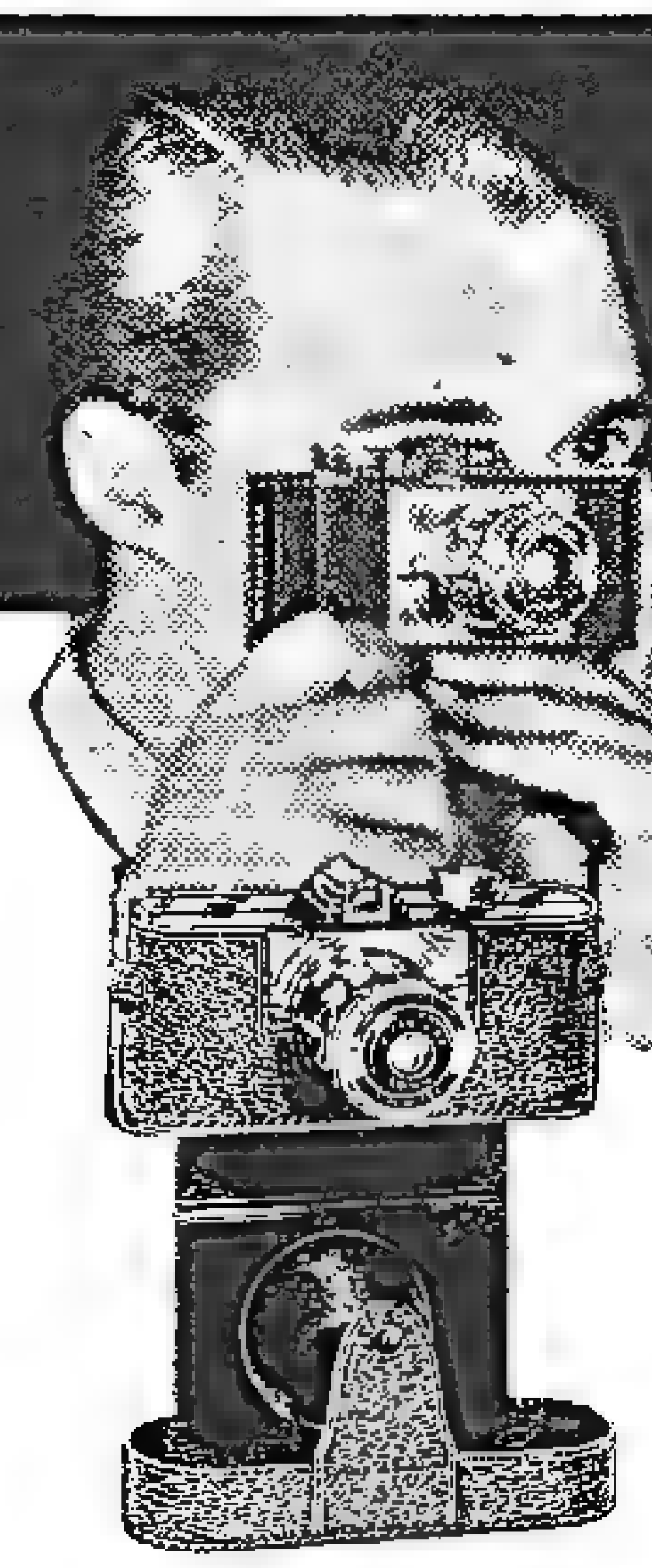
1. Boil small quantities of the sediment, scum, seaweeds or material of any nature in strong hydrochloric acid for five or ten minutes to remove all calcareous matter. A 400 cc Pyrex baker is recommended for this work.
2. Wash in several changes of water by filling the vessel with clean water and allowing diatoms to settle, then pouring off the water carefully. Do this several times to remove all traces of the acid.
3. Boil in strong nitric acid to remove organic matter.

[*Continued on page* 146]

What About The Airship?

[*Continued from page* 77]

imagine that casualties and costs in connection with airships have been inordinately great, and altogether out of proportion to the pioneering involved. It is vexatious to see standards of costs and casualties invoked against the airship but overlooked or accepted in other comparable endeavors. Actually, as can be shown, the airship is the least offender of all. It is high time for a sane interpretation of the actual facts, and a better public understanding of the true airship situation.



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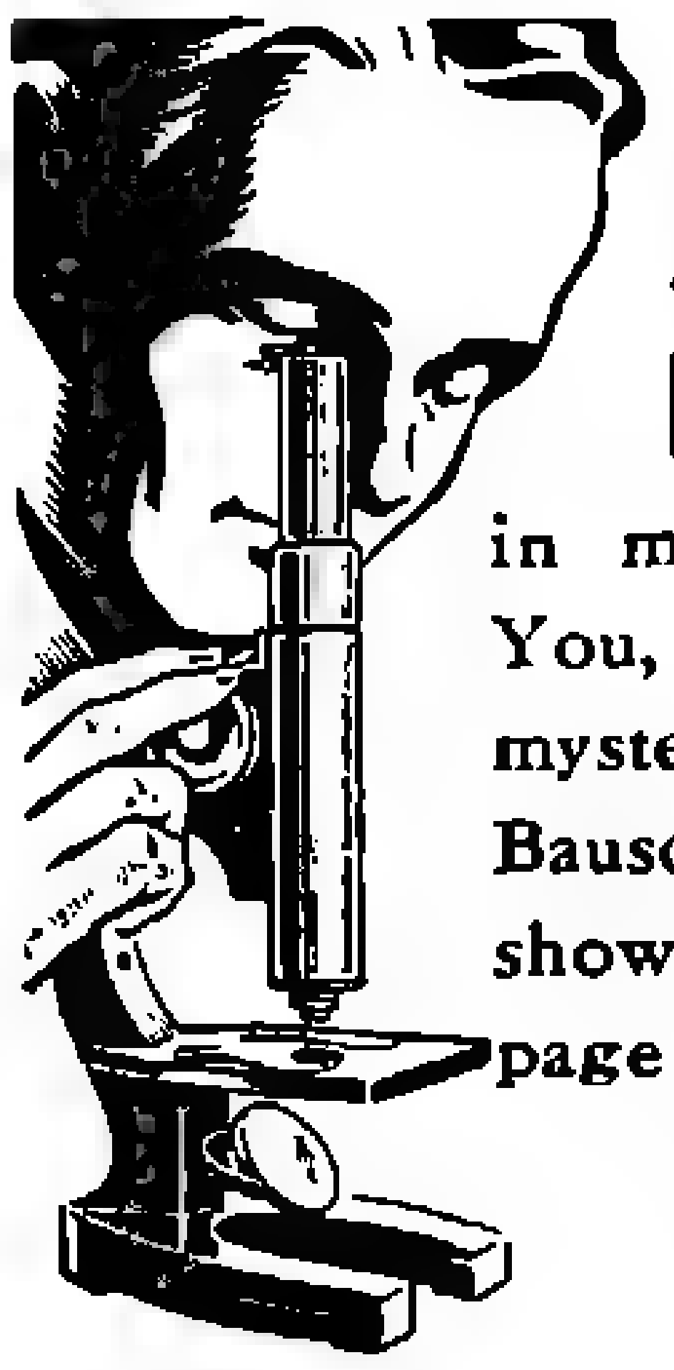

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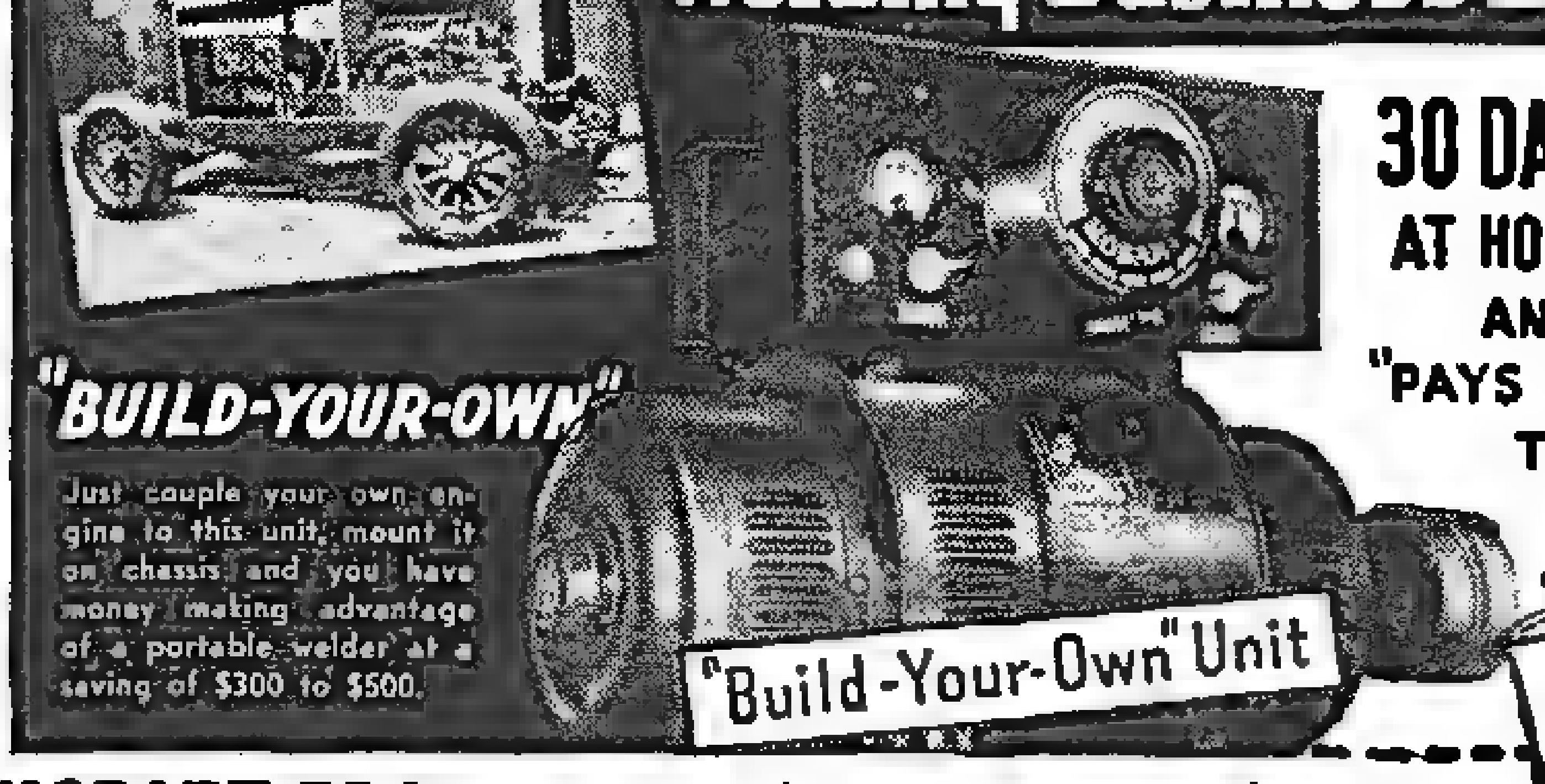
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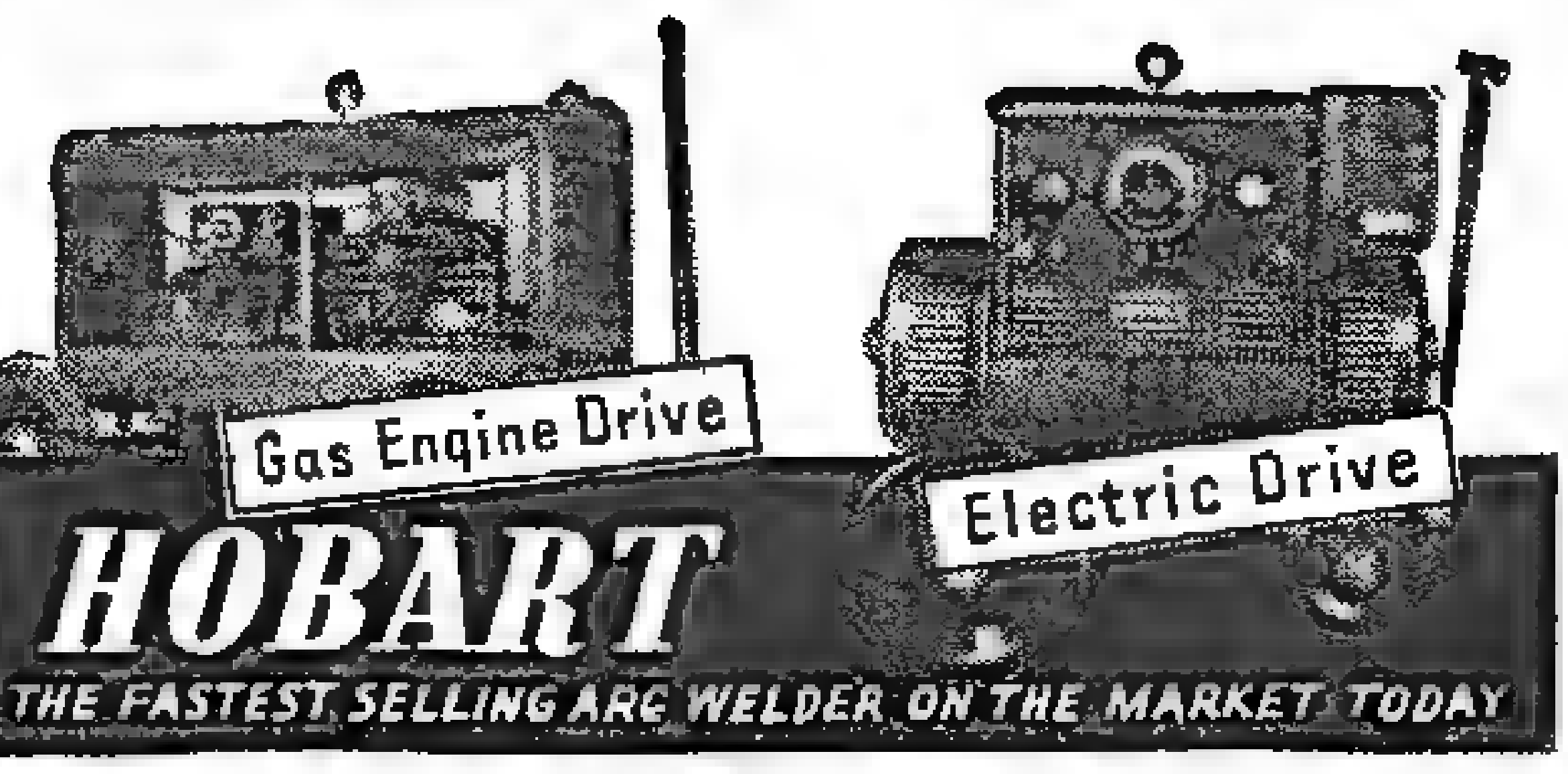

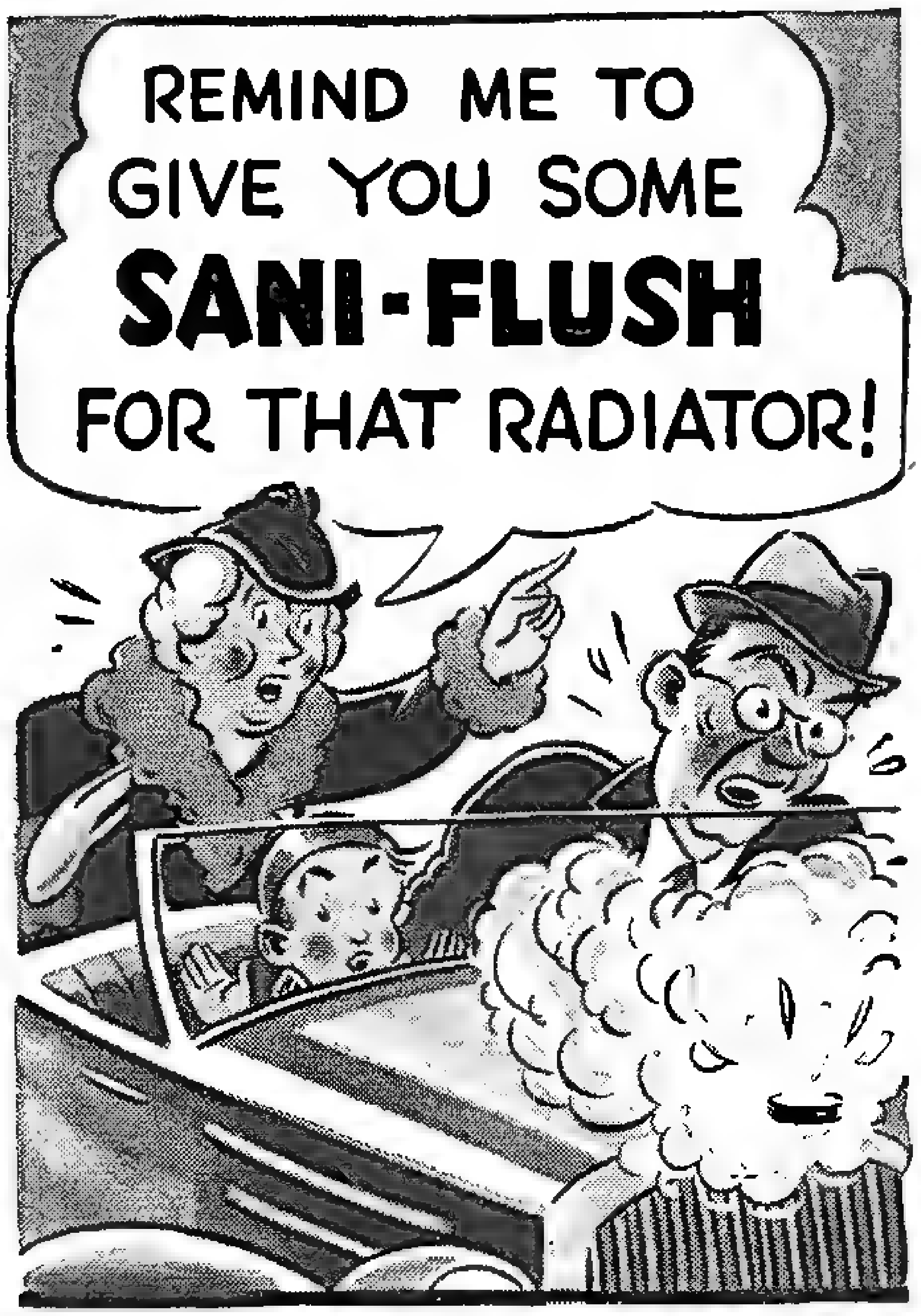
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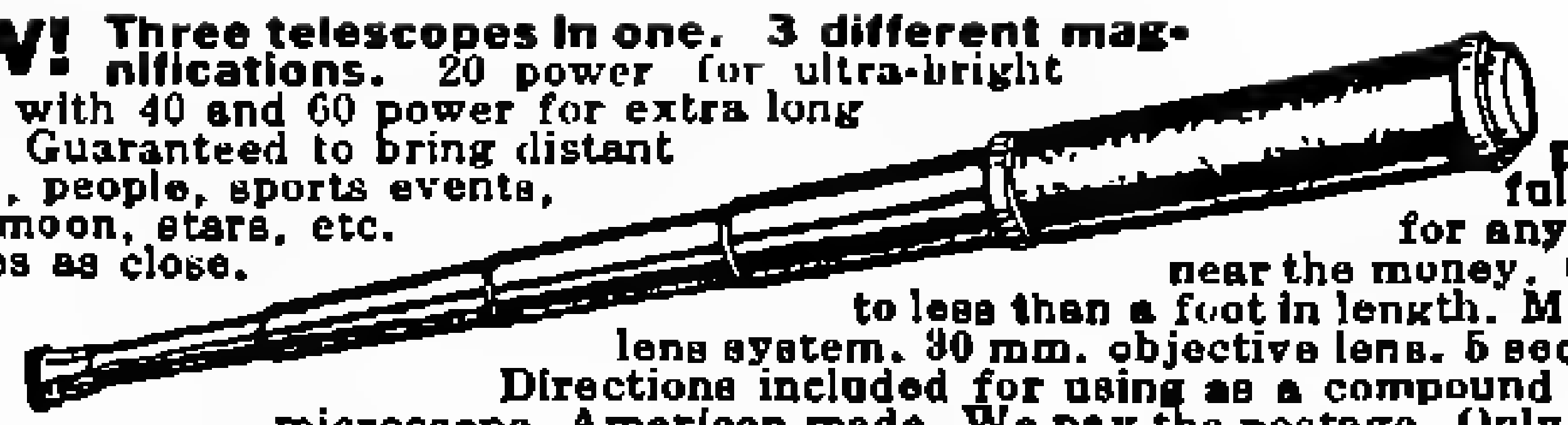

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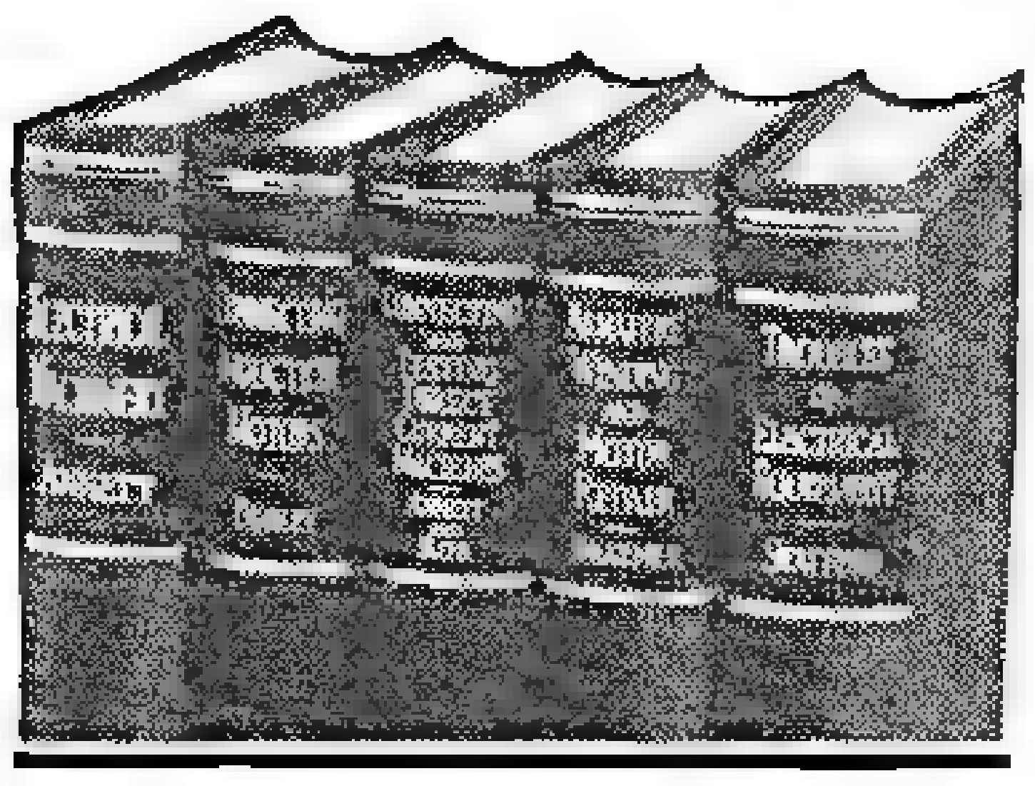

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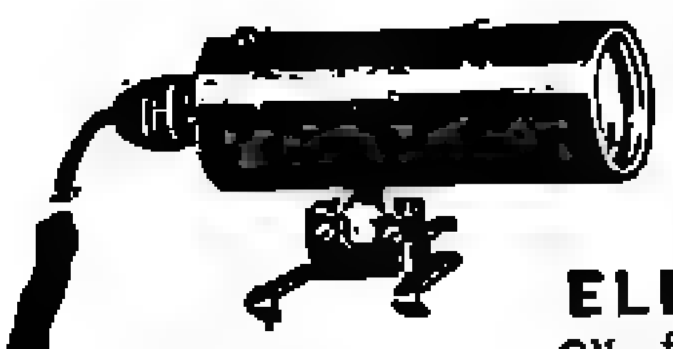

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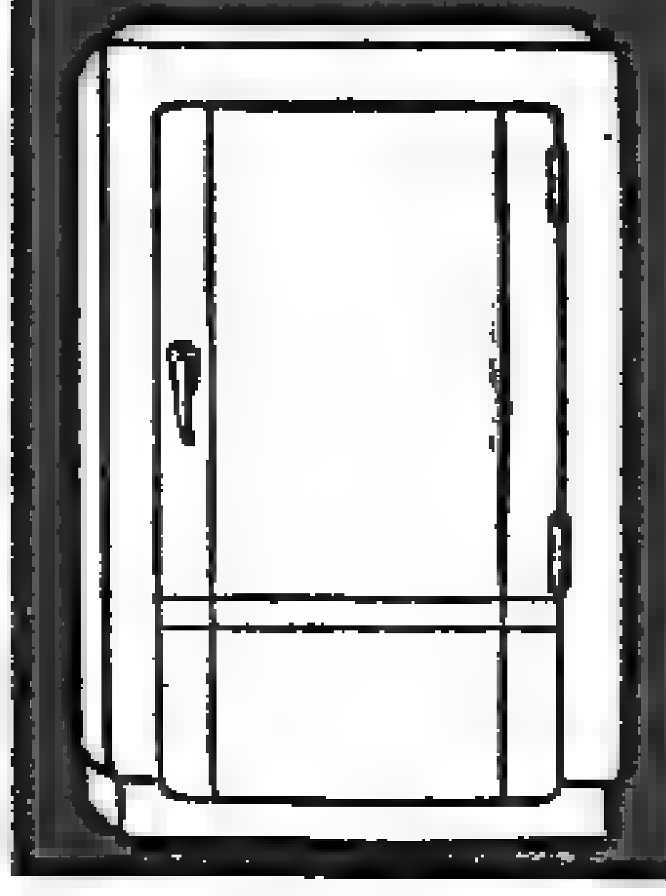

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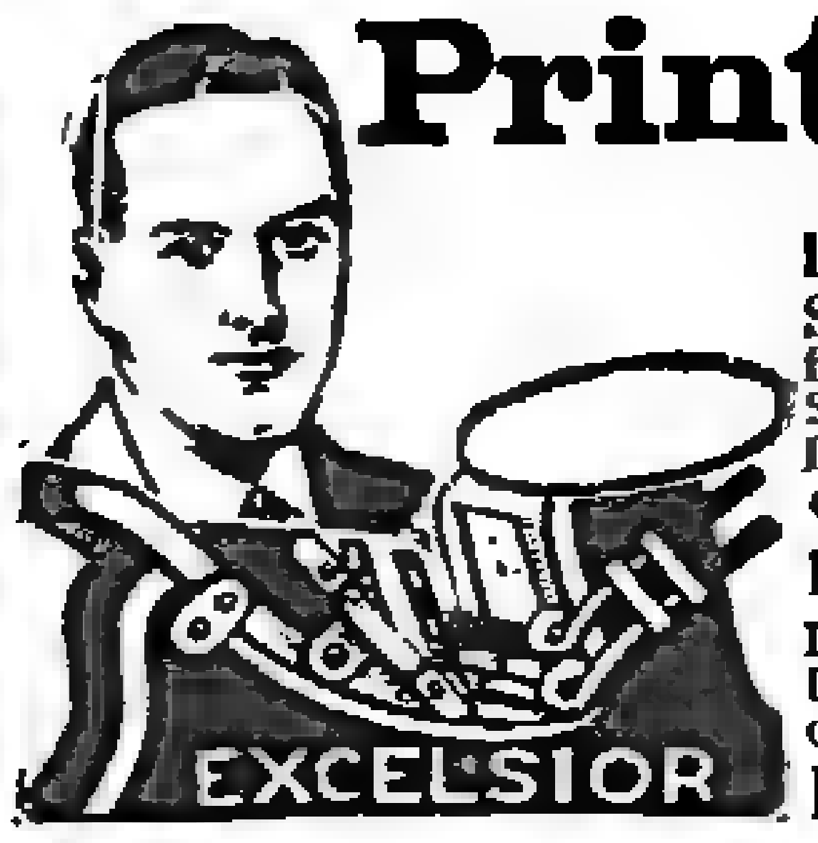

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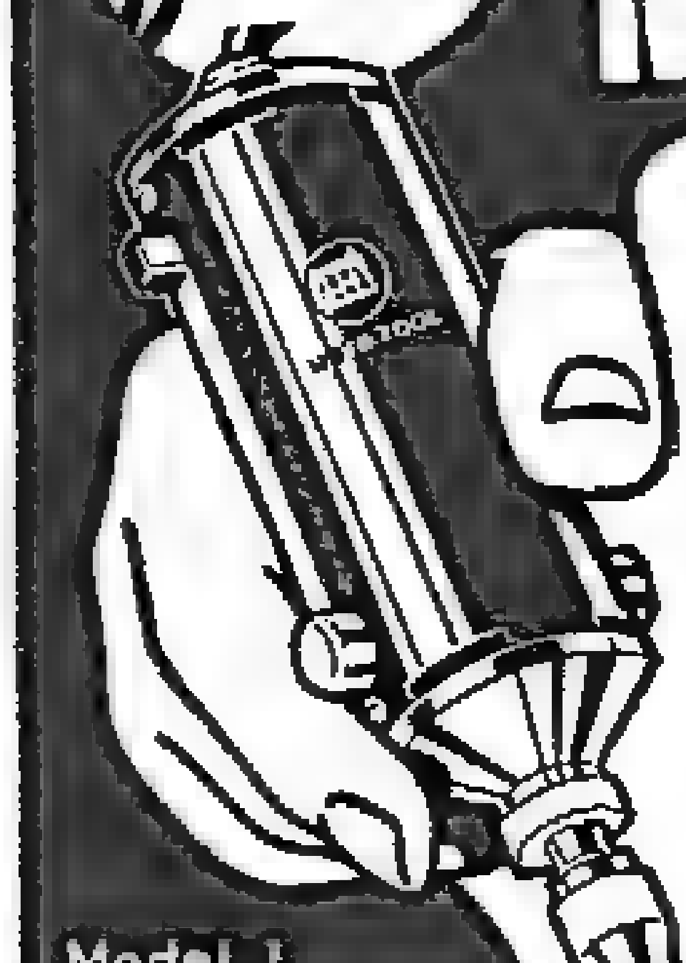

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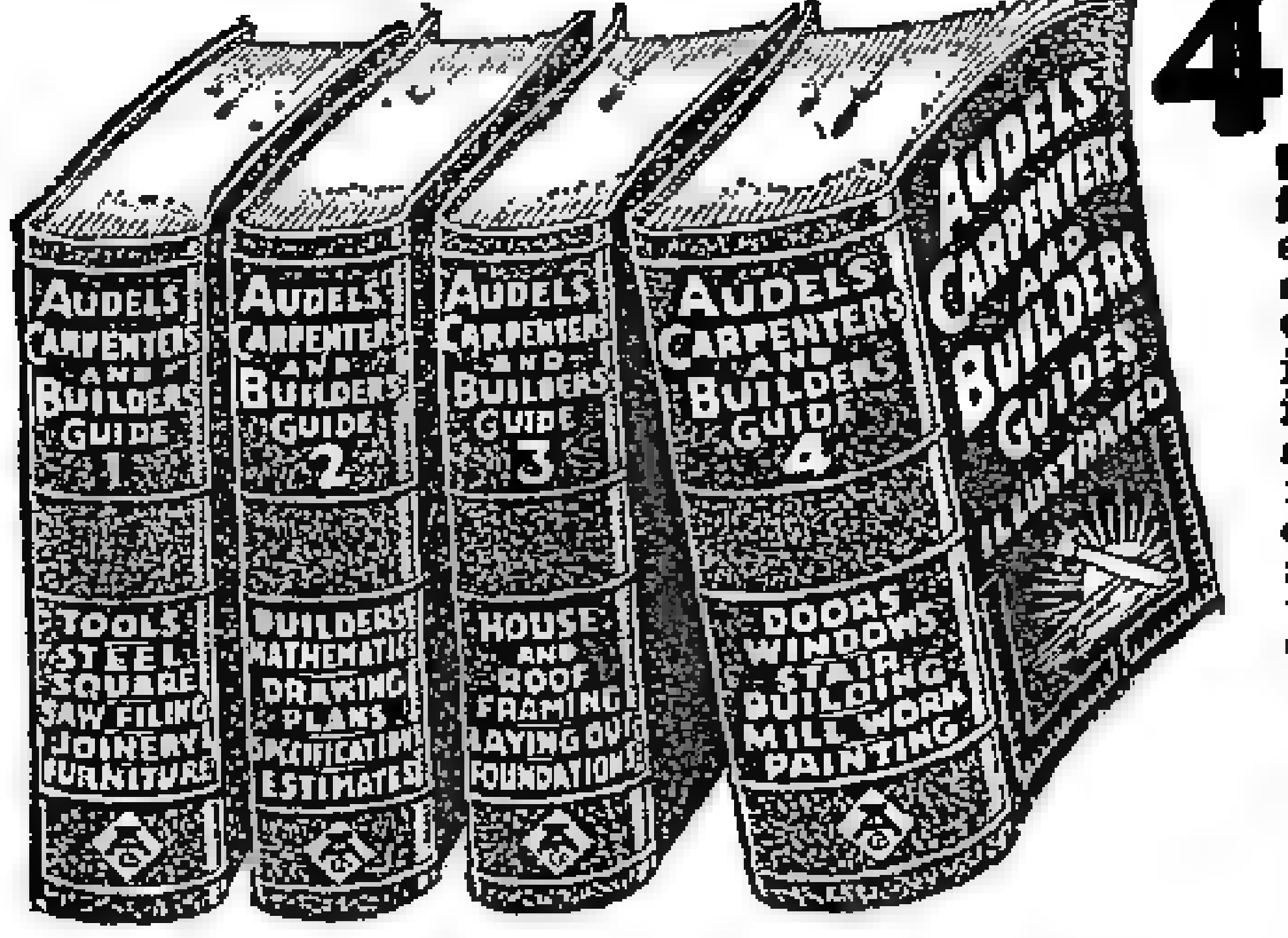
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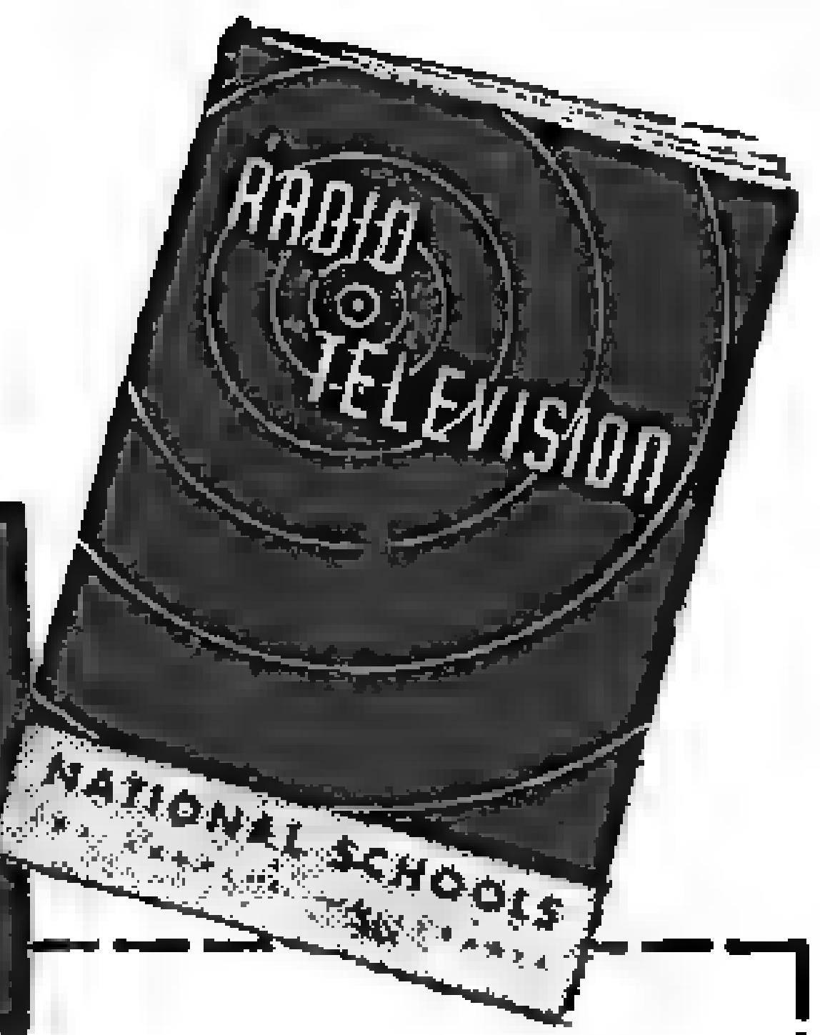

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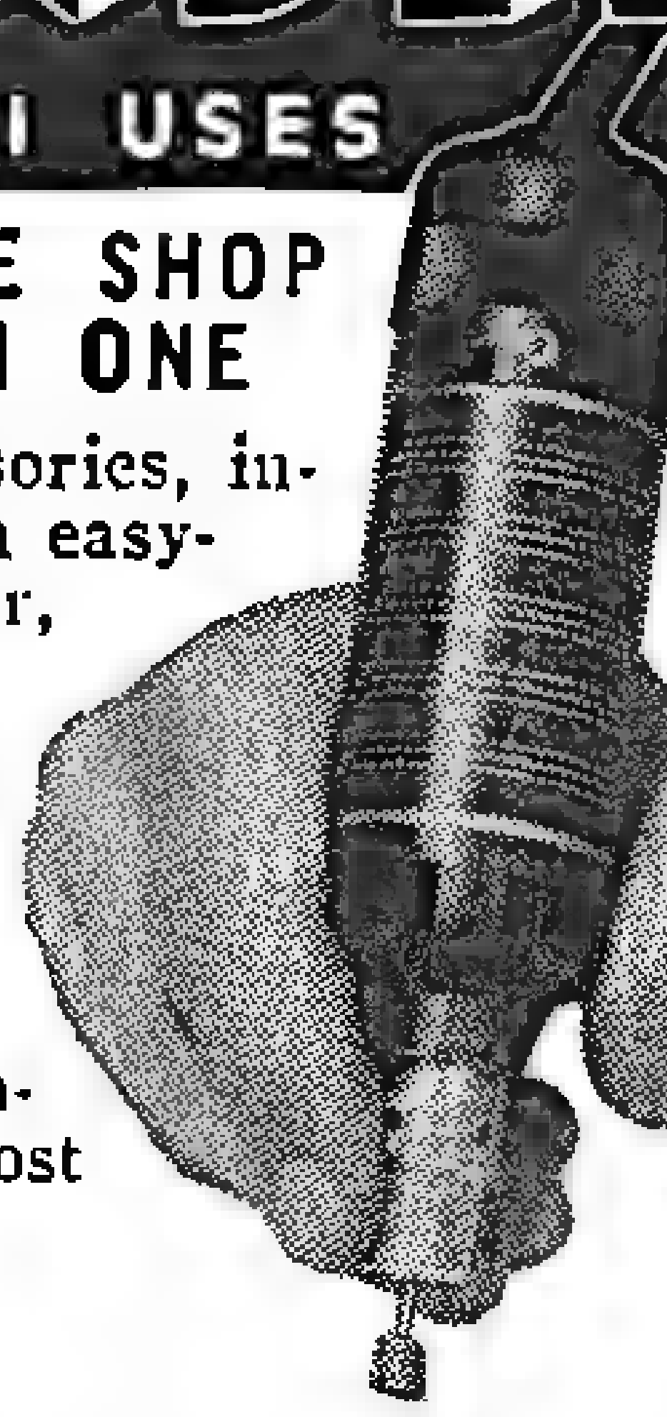

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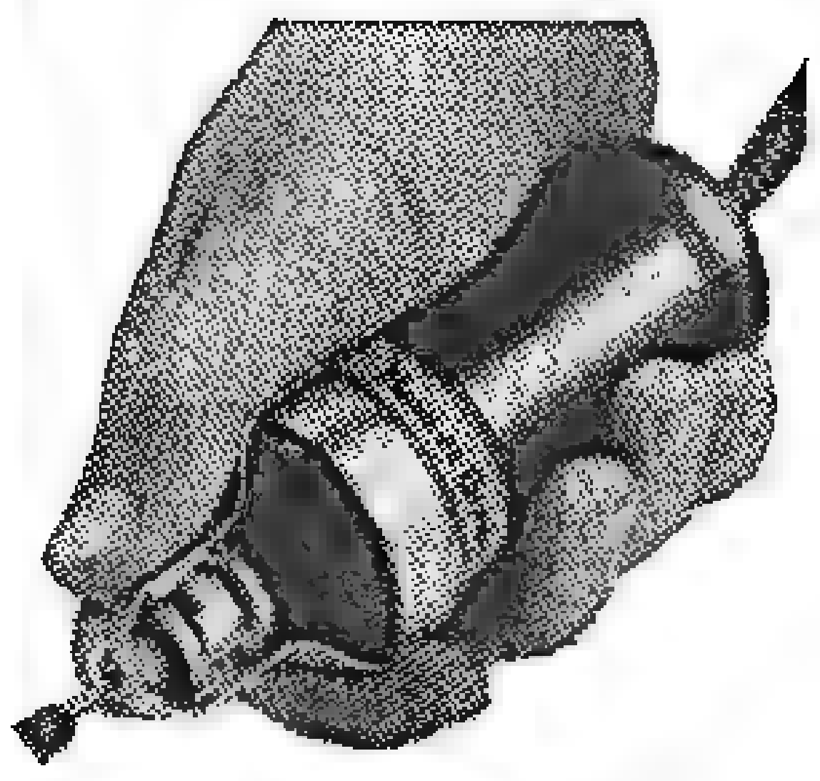

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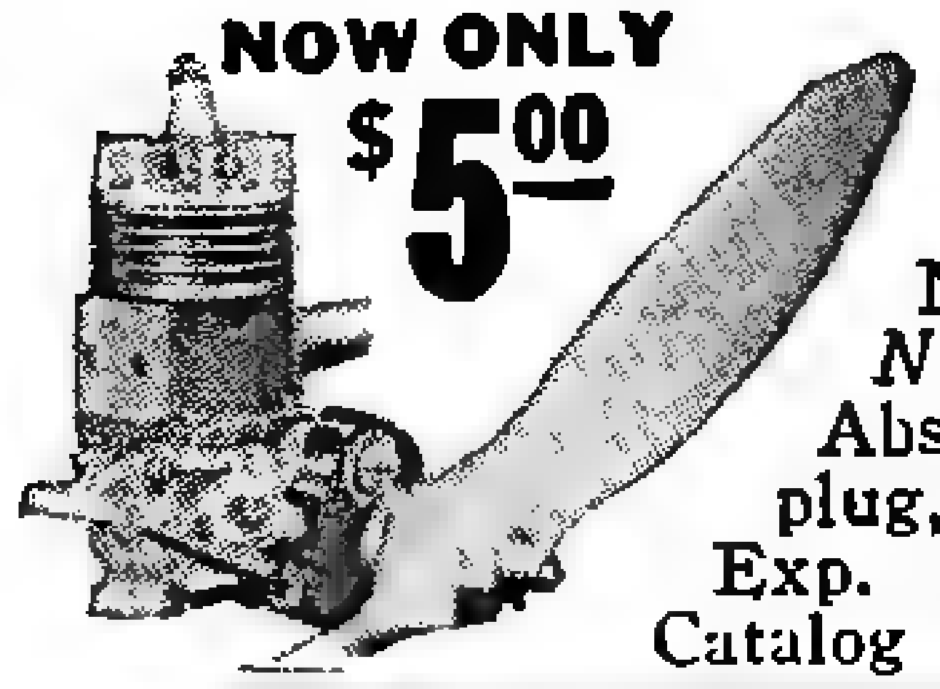

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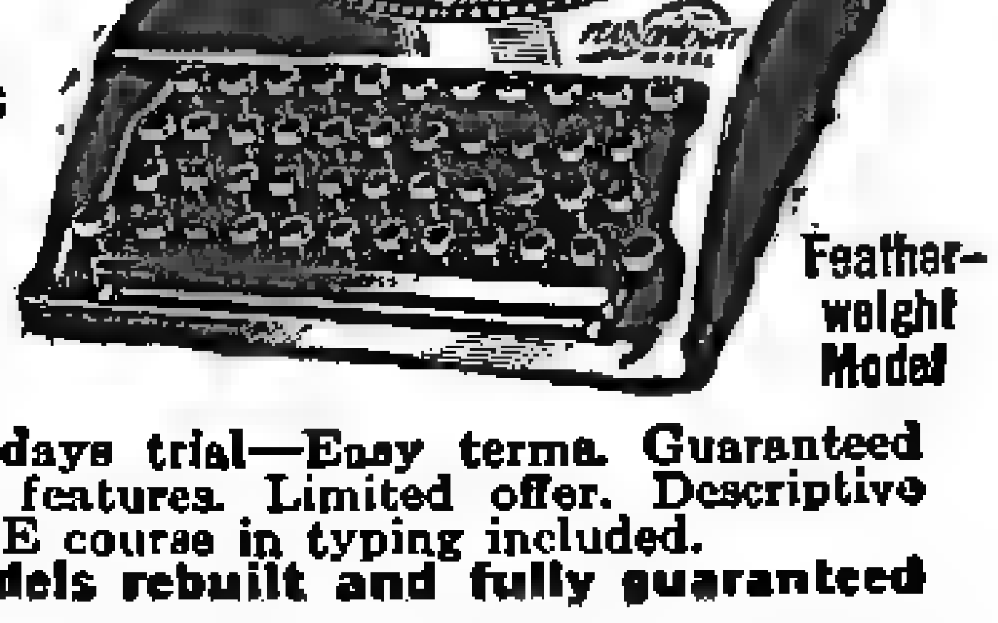

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Get One Now for Hallowe'en

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Remember, unlike most guns, it costs practically nothing for ammunition. Just go into the kitchen and help yourself. The pistol is well and strongly made, patterned after the style of a regular automatic, measuring five inches in length, just the right size for the pocket; weighs about 6 oz. Price Postpaid.. **25c**
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Slips over hand like a glove, so you manipulate head and hands with your fingers. It climbs, nods, bows, even "talks" when you know ventriloquism! Absurdly quaint and funny. Provokes side-splitting merriment. Price........ **15c**
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300 Shots 10c

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JOY BUZZER 28c

Funniest novelty ever invented! Fits the finger like a ring, but concealed in palm is the TICKLER. The buzzer, or tickler, contains a clockwork mechanism that is wound up. Whenever it is touched, the mechanism is released, giving the victim a shock. Every time you shake hands, your friend will get a violent shock. Touch them on the back, and watch them jump. They will hit the ceiling if they sit on it. Under a sheet it feels like a mouse. Use it as a "tic-tac" on window. Hundreds of uses. Price... **28c**

BIG ENTERTAINER

326 Jokes & Riddles, 25 Tricks, 10 Parlor Games, 73 Toasts, 13 Stories, 105 Money Making Secrets, 22 Monologs, 21 Puzzles Problems, Comic Recitations, Funny Readings, 10 Parlor Pastimes, 13 Flirtations, 1000 Names & Their Meanings, 10 Picture Puzzles, 37 Amusing Experiments, Deaf and Dumb Alphabet, Shadowgraphy, Fortune Teller, Fortunes with Cards, Crystal, Tea Cup, etc., Hypnotism, Ventriloquism, Cut-outs for Checkers, Chess, Dominoes, Fox and Geese, 9 Men Morris, Anagrams, 25 Card Tricks, Crystal Gazing, etc. Now published in one big volume. Price Postpaid.. **15c**

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Very striking, quaint and uncommon. Oxidized gun-metal finish; skull and crossbones design; two brilliant flashing red or green stones sparkle from eyes. Said to bring good luck. Price.. **25c** In Sterling Silver, $1.00

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Front row is snake matches, which grow into long snakes when lit. Grows while match burns. Back row, regular matches. Shock your friend! He selects snake matches. You take the real ones! Postpaid.... **10c** 3 for 25c

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Build The M I Testmaster

[*Continued from page* 136]

resistance, R5. Since R5 is 167 ohms and the meter has an internal resistance of 250 ohms, the effective resistance of the two in parallel is 100 ohms. For one milliampere drain at 15 volts, the total circuit resistance must be 15,000 ohms. This is made up by making the first multiplier resistance, R6, 14,900 ohms. The remaining multipliers are added in series as shown. For the 75-volt range, the series resistance of 60,000 ohms, R7, brings the circuit resistance to 75,000 ohms, or 1,000 ohms per volt.

For a. c., SW2 is flicked to the opposite position and the meter is thus connected across the rectifier. R5 is no longer in the circuit but the unavoidable losses due to rectification, in conjunction with those introduced by the three resistors which are enclosed within the copper-oxide rectifier assembly, make the effective sensitivity to a. c. the same as for d. c.

The slight additional compensation required is provided by shunting R6 with the .05 mf. condenser C1, so that slightly more current is passed on the 15-volt a. c. range.

The ohmmeter ranges are designed for high accuracy and low battery voltage requirements. On the "low" scale, the 1½-volt battery is shunted across R4 when the test leads are connected across the two lower terminal pin jacks and the leads are shorted. The current through R4 is then 1.5/240 or 6.25 ma. The meter takes .4 ma. for full scale deflection, so R3 and R2 are required to limit the current to this value. At 1.5 volts, R2 and R3 will have a combined value of 1.5/.4 or 3,750 ohms, minus the meter resistance of 250 ohms, giving a net value of 3,500 ohms. The total circuit resistance is formed by R4 paralleled by R3, R2 and the meter in series equal to 240 ohms shunted by 3,750 ohms, or 225 ohms. Connecting the test leads to a resistance of 225 ohms will reduce the current in the circuit to exactly one-half, which corresponds to the half-scale calibration on the ohmmeter, or 225 ohms. Thus the ohmmeter is accurately designed.

The multiplier and shunt resistors are soldered directly to pin jacks and other terminals as shown in the photograph. The potentiometer, R2, is first mounted on a small piece of strip brass so that only the shaft projects through the panel. The shaft is cut off and a slot is sawed in the end for screw-driver adjustment. The two 4½-volt flashlight batteries are connected in series and the two outer terminals are wired to screws in the sub-panel. The large 1½-volt cell is held in place by lugs fastened to the brass brackets holding the flashlight cells in place. The ends of these lugs are soldered directly to the 1½-volt cell terminals.

It will be noticed that there are more resistors in the assembly than are called for in the schematic diagram. Because many of the values required are not stock sizes, they are made up by connecting readily-obtainable resistors in series or parallel to obtain the desired values. All resistors up to R7 are wire-wound types with a rated tolerance of plus or minus 2 per cent. R8 to R10 are semi-precision carbon resistors, rated plus or minus 5 per cent.

Diatom Slides For Microscope

[*Continued from page* 138]

4. Wash as before, in several changes of water.
5. Boil in sulphuric acid.
6. After boiling and while still hot, add a few small crystals of potassium chlorate. This will cause a violent effervescence and must be done carefully in an open dish. Continue to add these crystals until the mixture no longer effervesces.
7. Wash in several changes of water, as before, and the cleaning is completed.

Note: When boiling acid, do not breathe the fumes as they are injurious. These operations should be done outside.

Diatomaceous earth is first broken into small lumps by stabbing with an ice pick, then a layer of these pieces is placed in an old saucepan and covered with a similar layer of dry crystals of hypo (sodium hyposulphite). Do not add any water. Heat until the hypo crystals are melted and have saturated the pieces of earth. After it has cooled for two hours, add more dry hypo crystals and heat again to insure that the melted crystals have thoroughly permeated the earth. Allow to become completely cold, whereupon the hypo will have recrystallized and in so doing have broken up the earth into its finest particles.

Now fill the saucepan with water, making a muddy mass which will soon settle into sediment and scum. This scum will contain only perfect diatoms, floated by the air trapped within them, while the sediment will have perfect as well as broken specimens and all other solids. Skim carefully and thereafter treat the scum and sediment separately, the latter being well worth saving. Clean by first washing in several changes of water to remove the hypo, then boil for ten minutes in a strong solution of washing soda; wash in water (several changes), then pass in sucession through the seven steps outlined in the cleaning schedule above, beginning with boiling in hydrochloric acid.

A small quantity of the cleaned diatoms may now be shaken up in a bottle partly filled with distilled water. Place a drop of this mixture on a slide and examine under a microscope. Add more diatoms or more water to the bottle until the proper concentration is obtained so that there are plenty of specimens in the field, but not so many as to crowd or overlap. Now place a large drop of this adjusted mixture in the center of a clean slide and allow to dry completely, then add balsam and a cover glass, thus making a strew slide. The bottle will contain material sufficient for a hundred or more slides.

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your first taste
of VELVET
the smile's too big
for the picture!

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PIPE AND CIGARETTE
TOBACCO
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Better smoking tobacco

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—*the MILDNESS*
of fine old
Kentucky Burley
aged in wood

—*the FLAVOR*
of pure maple
sugar for extra
good taste

Velvet packs easy in a pipe
Rolls smooth in a cigarette
Draws right in both

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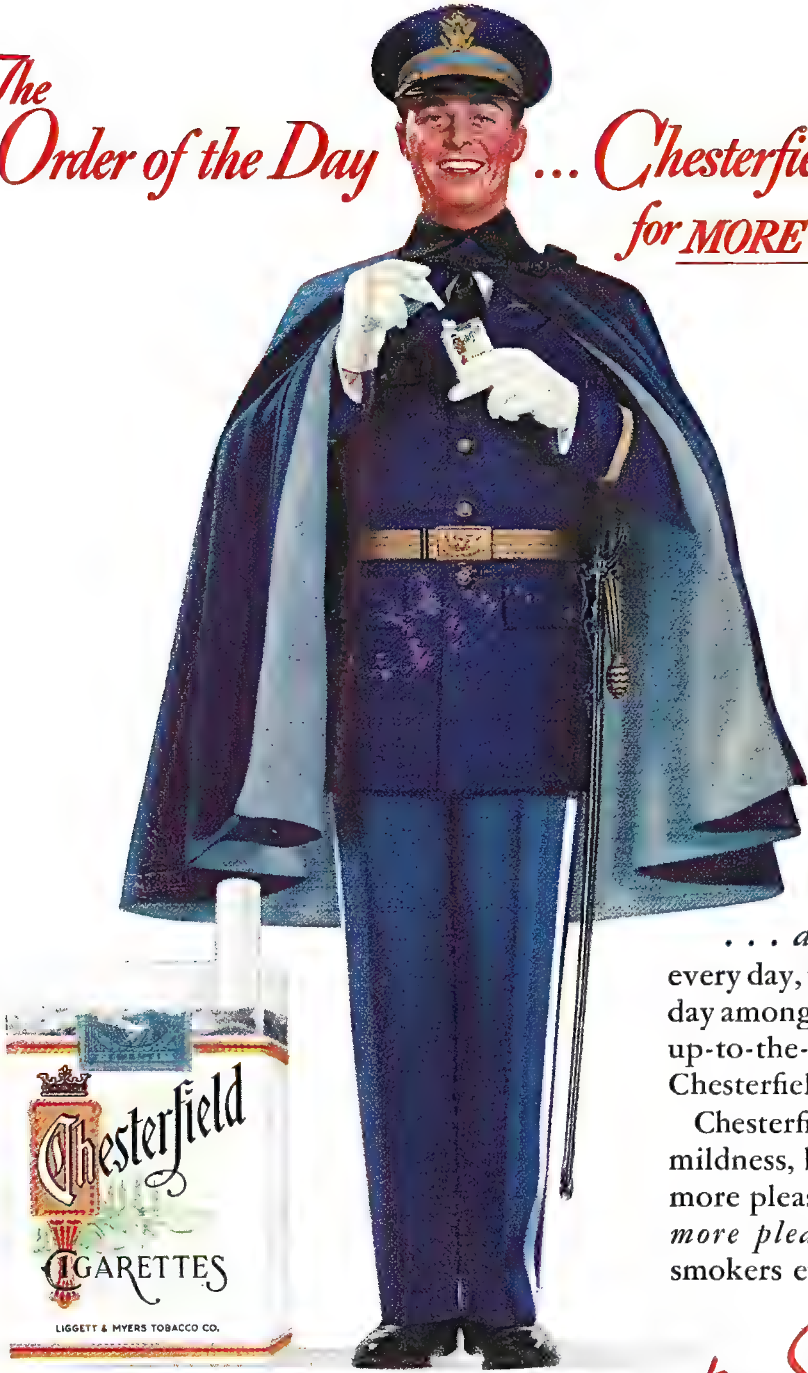
The Order of the Day . . . Chesterfields for MORE PLEASURE


Chesterfield
CIGARETTES
LIGGETT & MYERS TOBACCO CO.

This new uniform is now the order of the day for dress in the U. S. Army.

. . . and everywhere every day, the order of the day among smokers is that up-to-the-minute pack of Chesterfields.

Chesterfield's refreshing mildness, better taste and more pleasing aroma give *more pleasure* to more smokers every day.

They Satisfy . . millions

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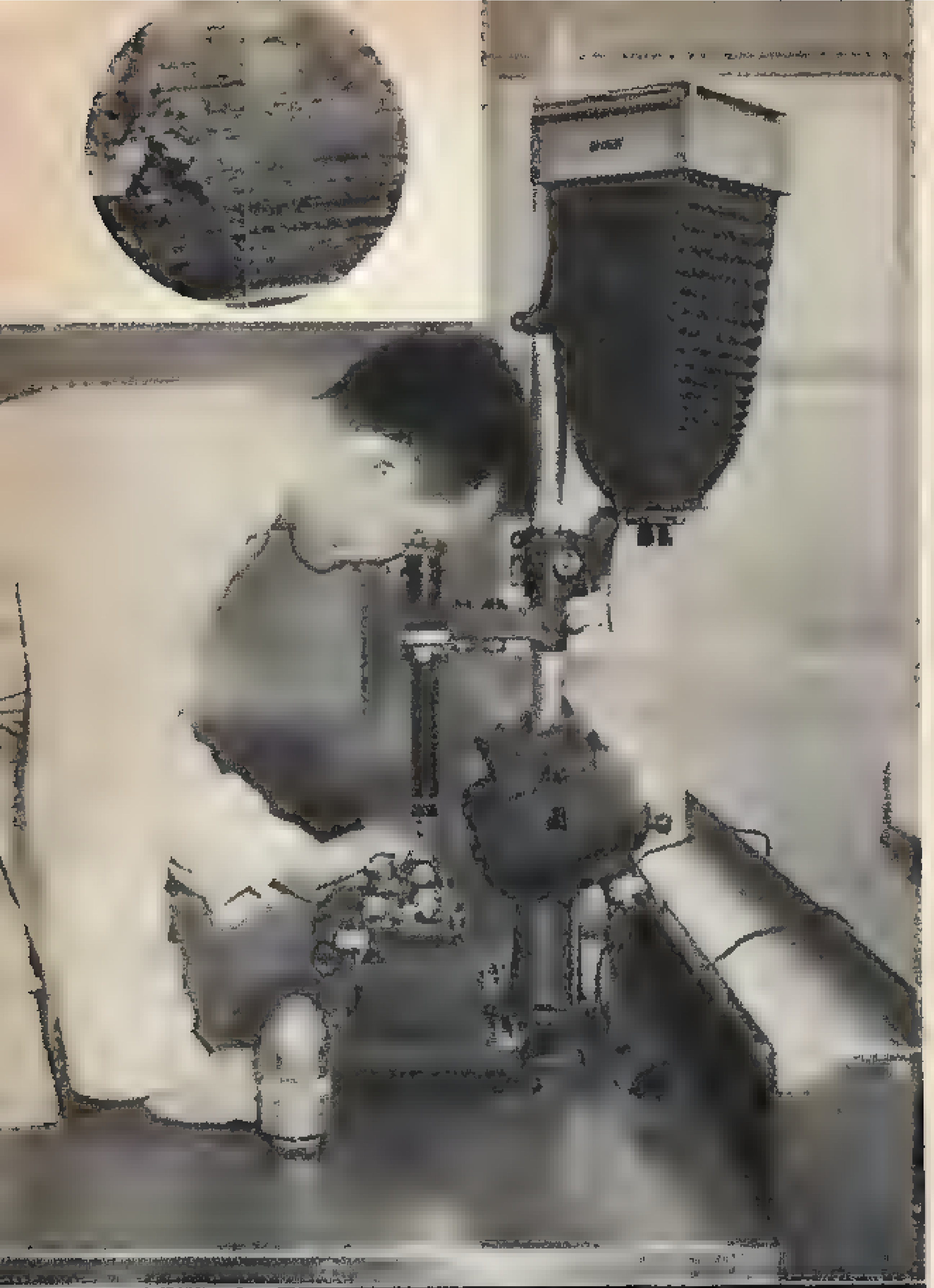
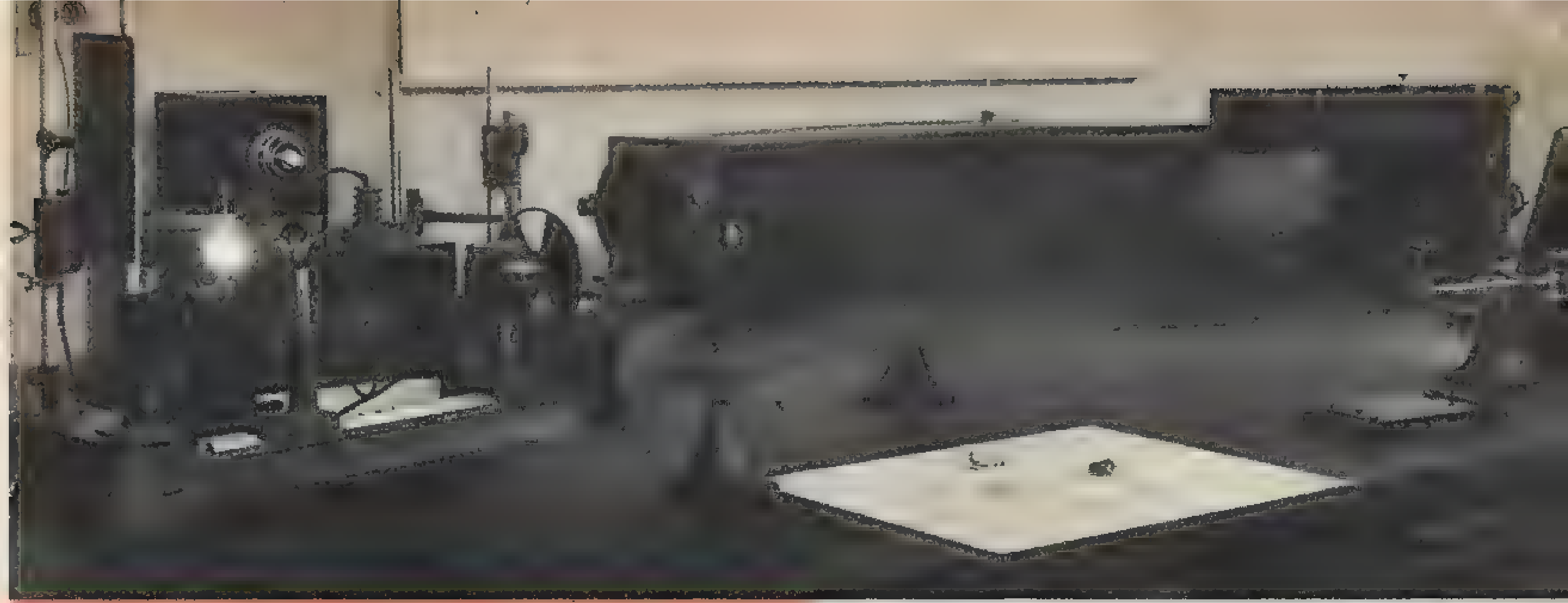
Double Page Spreads



A G-Man technician at the comparison microscope checks a bullet fired from the gun of a suspect. The inset shows how two bullets from the same gun have similar markings. Below: experts collect dust and debris from clothing for microscopic study.

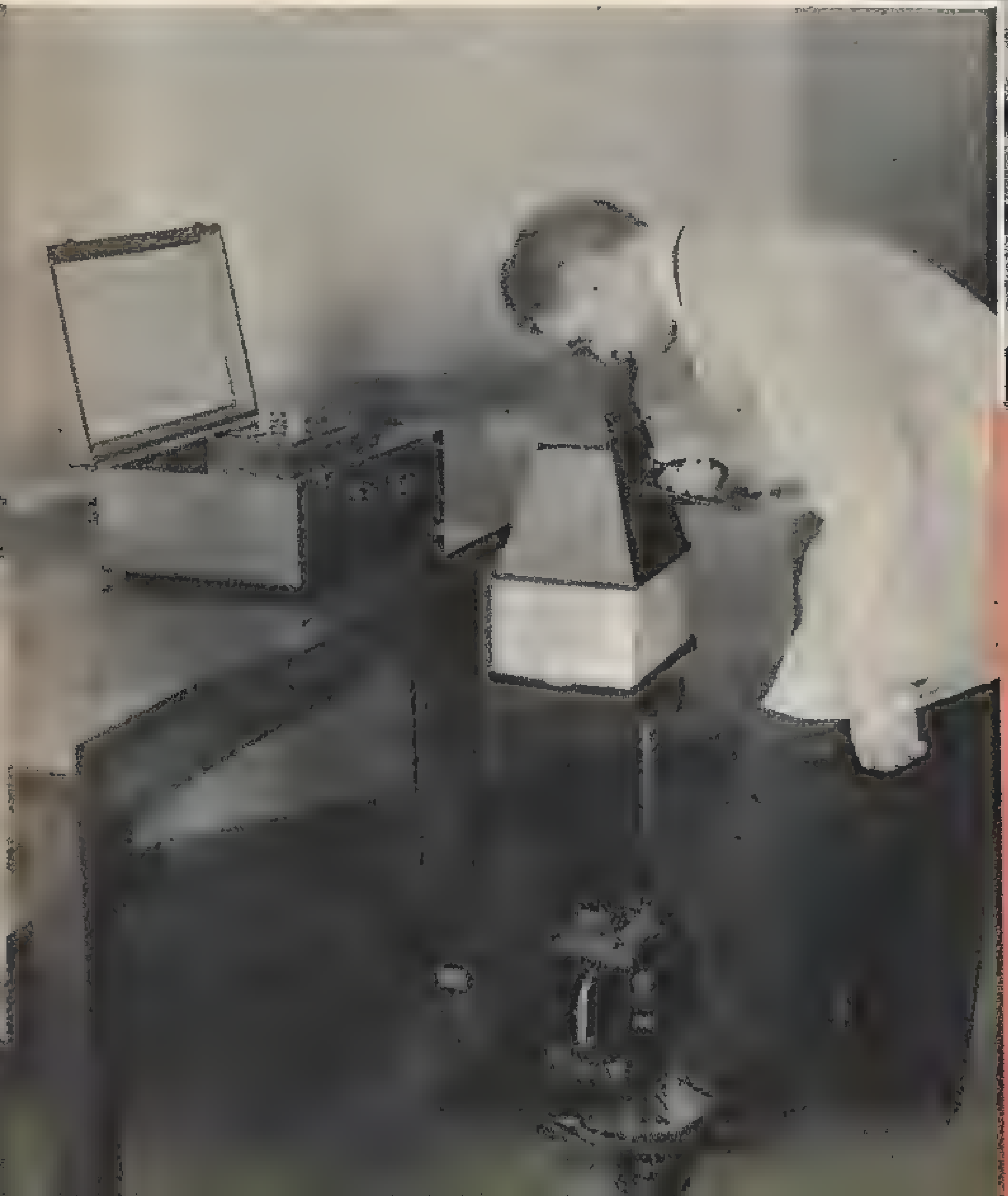
August 21, they admitted the crime which they later repudiated in part. In the subsequent investigation conducted by the Federal Bureau of Investigation, the Bureau's crime laboratory established that soil picked up at the scene of the murder contained human blood. The clothing of the defendants and the automobile crank were also shown to contain blood and the pocket knife fitted rents in the victim's clothing. Minute bloodstains were found on parts of the automobile, in spite of its burned condition, and this evidence resulted in the conviction of the defendants.

This murder was solved in the crime laboratory of the Federal Bureau of Investigation, in Washington, where scientists are performing feats which would startle the imagination of a Sherlock Holmes. With microscope, ultraviolet lamp, test tubes, spectrograph, refractometer and parallel light rays, science tracks down America's most vicious criminals. Bloodstains, human hairs, scrapings from under fingernails, burnt letters and threads of cloth tell tales of the dead to scientists trained in crime detection. No examination is too complicated for the G-Men of science, who last year alone made nearly 7,000 examinations involving over 33,000 specimens of evidence.



The spectrograph breaks up light into its component wave lengths or colors for analysis. It reveals markings on writing pads and other impressions.

On the FBI's scientific staff are men engaged in the work of document identification and firearm examination. Others are experts in geology and metallography, particularly as they relate to soil analysis and the examination of metallic instruments from which identifying numbers have been removed. Problems relating to sound, radio and electricity are handled by qualified technicians. A reference collection of rope and cord and specimens of hair and fibres, as well as equipment for making moulage or plaster re-



Above: Electric muffle furnace burns material for comparative analysis. Right: X-rays are used to expose the contents of suspicious packages. Sometimes the technician sees such objects as the homemade bomb shown below.

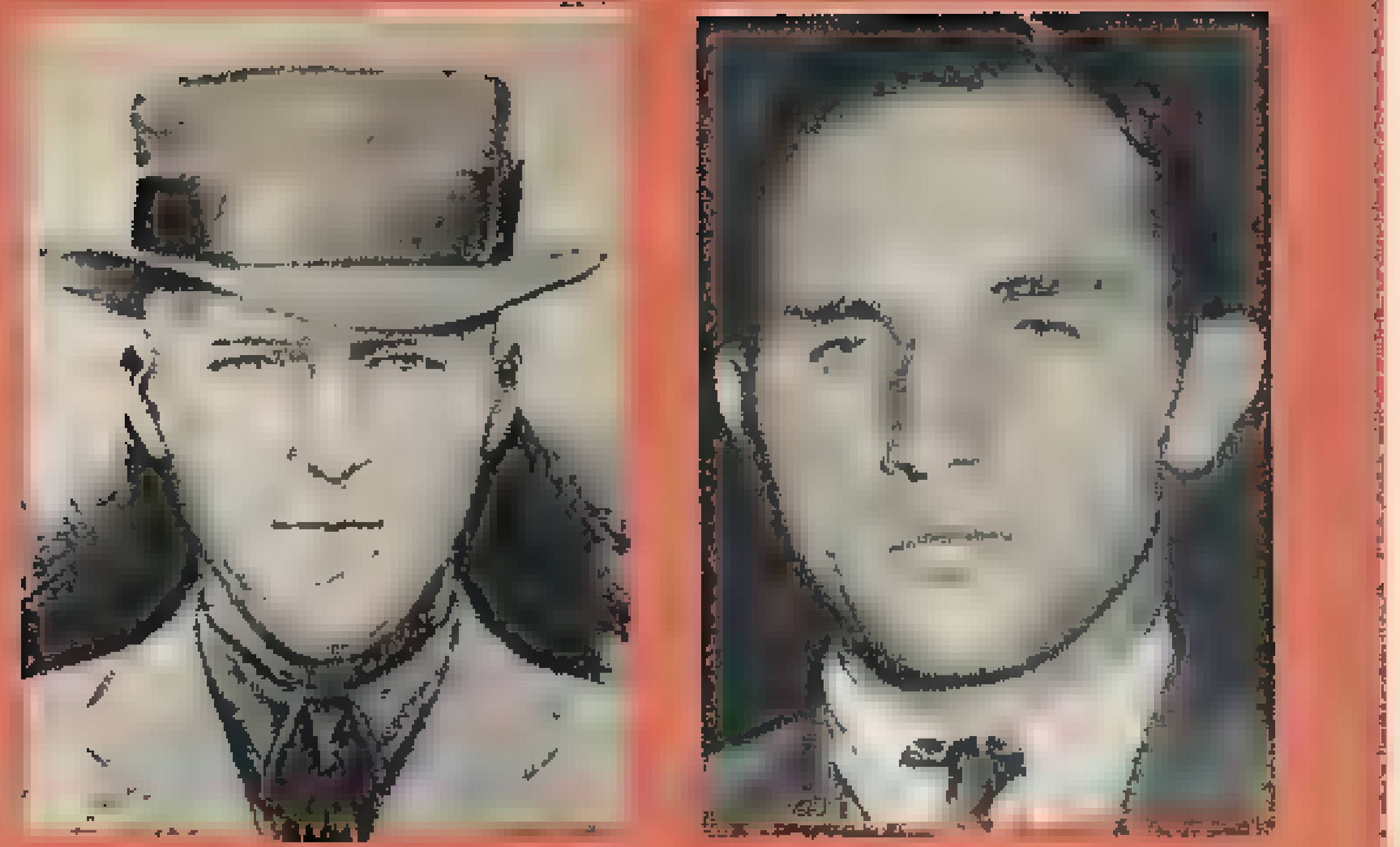
The above finger print machine automatically sorts cards in the larger finger print classification group, simplifying identification. The technician below is staining paper fibres for microscopic examination to determine the source of raw material.

productions of sections of the human body, tire treads and footprints, are part of the tools of these scientific G-Men.

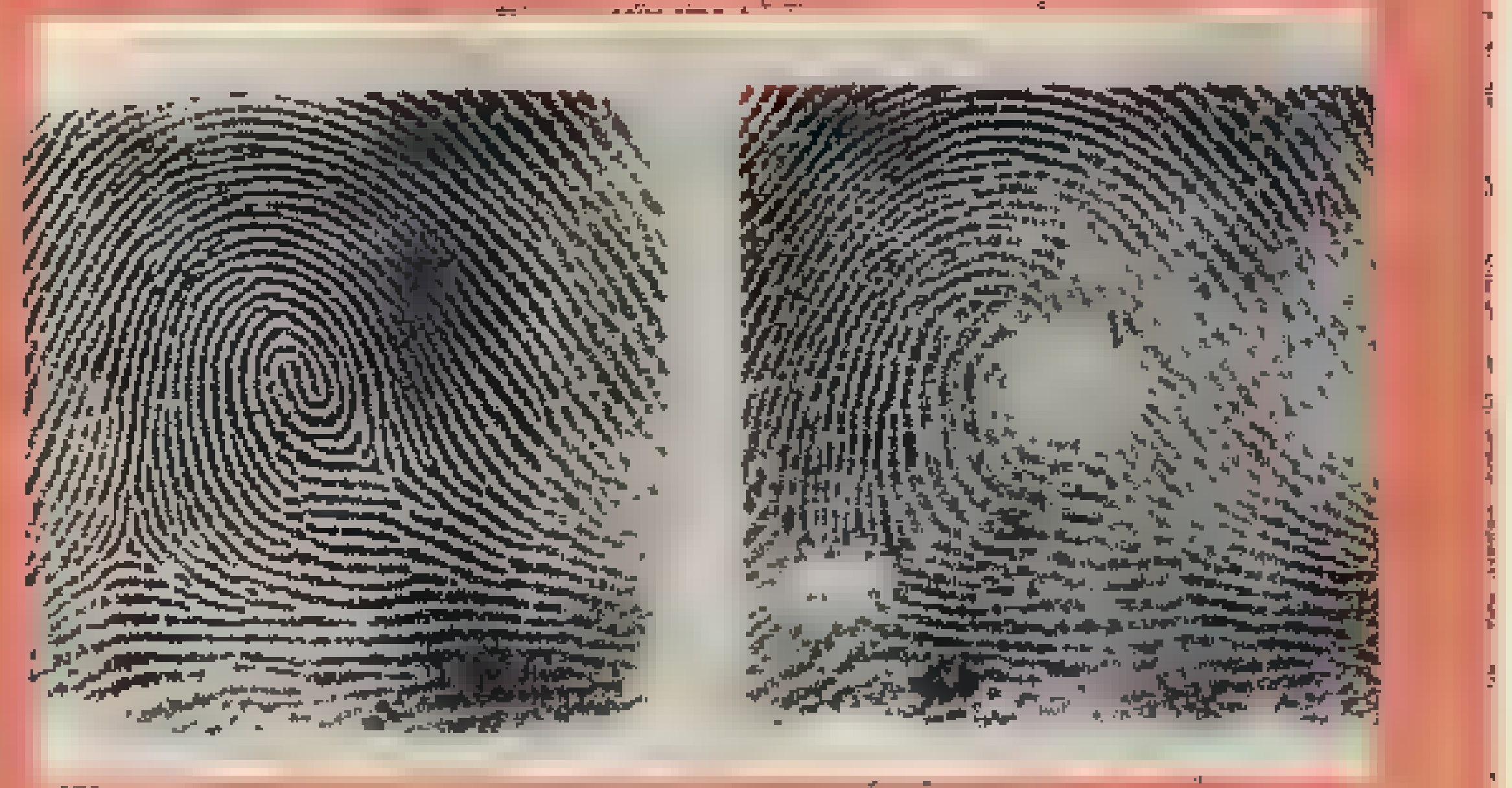
Not least among scientific methods in crime detection is the fingerprint division, containing over 9,000,000 prints—and a special file of nearly 14,000 fingerprints of America's worst criminals. The work of this bureau has proved the infallibility of lines and whorls and deltas of the fingertips so that a man may be identified no matter what changes have taken place in his physique, his facial characteristics or his name. How well the identification bureau works in tracking down public enemies was illustrated in the kidnaping of Edward G. Bremer of St. Paul, Minn. In seeking out every bit of evidence in this case, which occurred on January 17, 1934, G-Men picked up a gasoline can which, under chemical tests, showed a single fingerprint. Search through a special file revealed the print to belong to Arthur "Doc" Barker, a member of a murderous gang of outlaws with a record of bank robberies, plunder and assault throughout the Middlewest. G-Men trailed "Doc" Barker. They trailed his brother. They trailed his companions, Volney Davis, Russell Gibson, Bill Weaver and others, until they caught up with Alvin Karpis, who was cornered in New Orleans a year later. In all, 35 men and women who directly or indirectly played a role in the Bremer kidnaping were sent to jail or eradicated by death.

Like fingertips, even mechanical instruments have their tell-tale marks that reveal a picture of crime and bloodshed to scientific G-Men. A few years ago, when a prospector was found slain in a remote part of Alaska, the evidence in the case was taken by dog team across snow-covered wasteland and then flown to Fairbanks by plane. From there it was forwarded to Washington. This evidence showed that two persons were suspected. One was an ex-convict who was found leaving the area of the crime with a gun. He had blood on his clothes. The other was an Eskimo boy, also found in the neighborhood with a gun. At Washington the science laboratory examined the garments for human blood and the rifles for camparison with the murder bullet. Upon completion of the examination, word was sent to Alaska that the ex-convict was innocent and the blood found on his garments was that of an animal, as he claimed; but the bullet taken from the victim carried the same markings as a bullet fired from the gun of the Eskimo, and when confronted with the evidence, the boy admitted his guilt. A comparison in the G-Men's laboratory showed the two bullets to have identical markings.

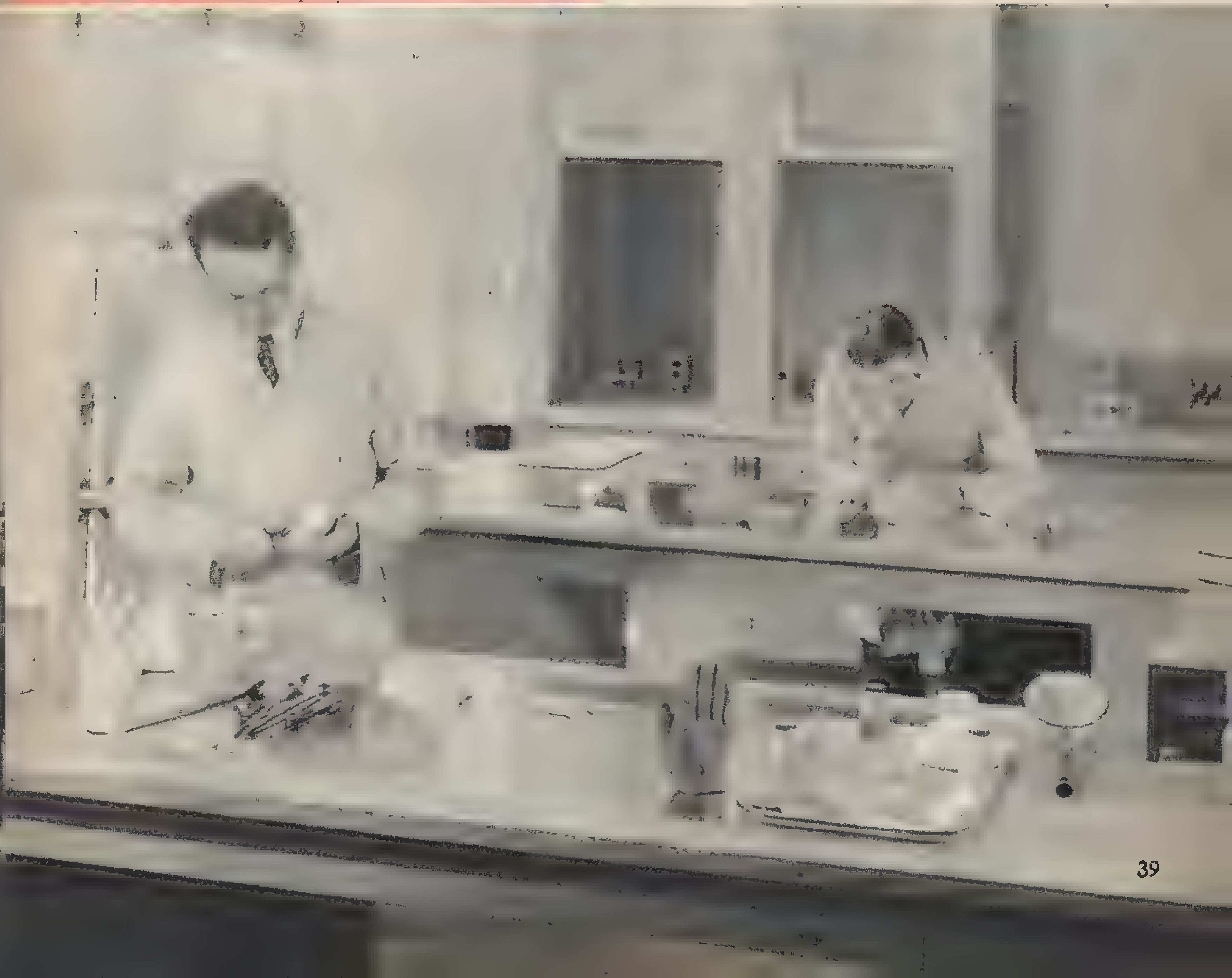
How the microscope and chemical analysis helped solve a crime that occurred April 5, 1936 in Jacksonville, Fla., was revealed

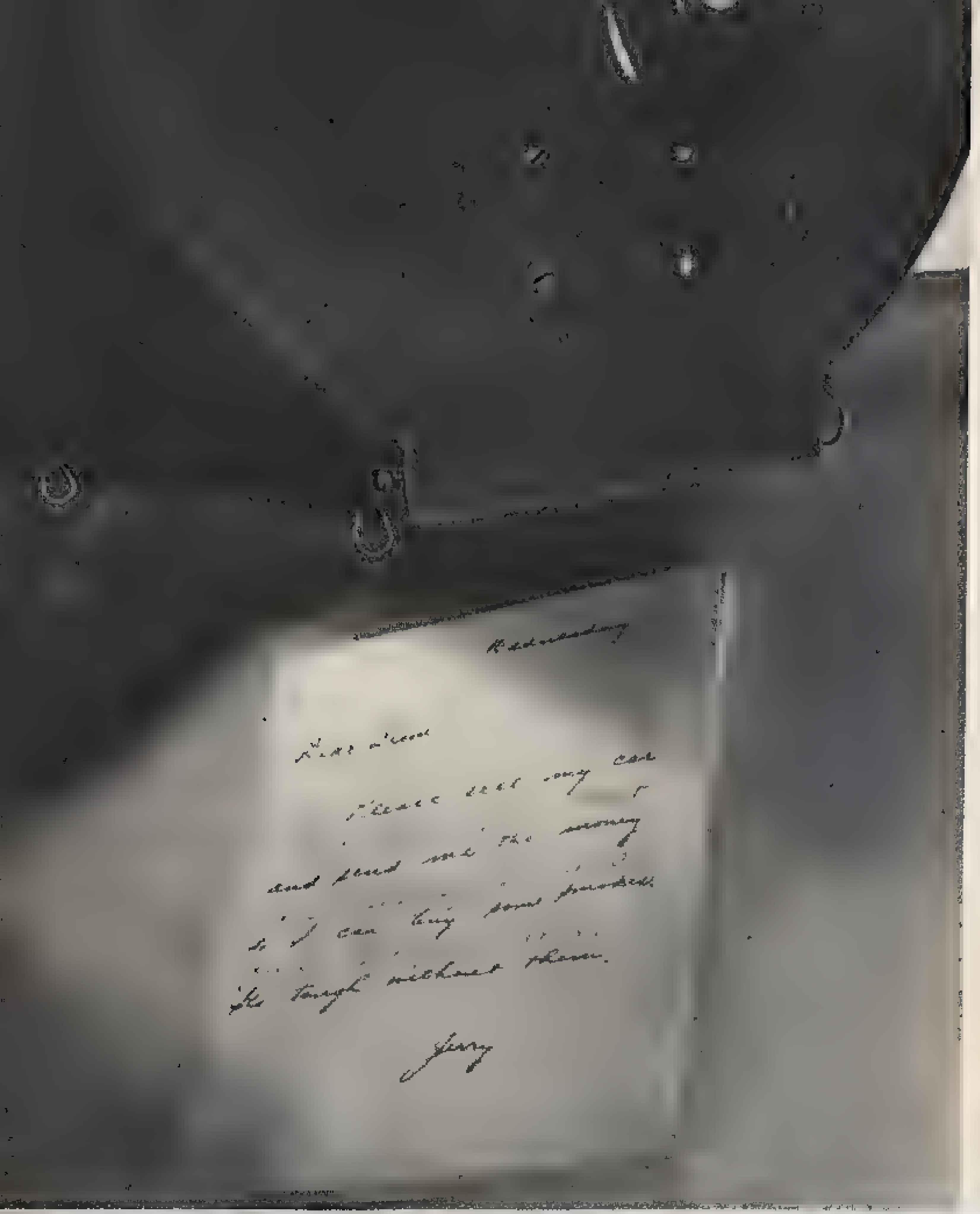


An artist's conception of the Lindbergh kidnaper shows a startling resemblance to Hauptmann, executed for the crime. When he was arrested, Hauptmann admitted having gained weight—rounding out his face.



G-Men established 324 points of identification between John Dillinger's original (left) and mutilated fingerprints (right). Moulage experts are shown at work below, reconstructing human hands and faces!





when the Florida state attorney called at the FBI's technical laboratory with evidence relating to the mysterious and brutal murders of Kate Powell and Lou Speer. They were killed in their home and the bodies were carted to the outskirts of the city and dumped in the river. During the course of the investigation bits of charred material were found near the river bank, indicating that someone had tried to burn clothing. A partially burned coat was found to be of the same material in a suit formerly owned by Marcus Powell, the husband of one of the victims. Several fragments of a pillow case and a piece of toweling used to gag one of the victims were also found in the region.

The staff of the crime laboratory found that a comparison of the charred coat material with the pants and vest of a suit belonging to Marcus Powell revealed the material to be identical. To effect this identification it was necessary to burn some of the uncharred material in an electric muffle furnace in order to produce in the known specimens fire conditions similar to that of the questioned material. A microscopic examination of the vest revealed minute blood particles. The toweling used for gagging the victim was found to be the same material as the kitchen towels in the Powell home. Microscopic examination of the unknown material showed that they consisted of bits of a cotton blanket and portions of a rug. The case against Marcus Powell, a former convict who had been twice before tried for murder, grew and eventually resulted in his conviction.

Among the technical equipment used by the crime laboratory in its war against public enemies is the parallel light ray, designed to reveal markings on paper and other surfaces ordinarily not visible to the naked eye. This machine is used frequently in studying ransom notes and writing pads from which ransom-note paper is alleged to have been taken. An example of its practical application was in the Dr. J. C. B. Davis kidnaping at Willow Springs, Mo. The doctor was kidnaped and held for $5,000 ransom and a note identified to be in his own handwriting gave instructions when and where the money was to be paid. G-Men were notified and within a few hours a staff of investigators arrived in Willow Springs and a temporary laboratory was set up.

The paper on which the ransom note was written could not be identified and a search of all stores within 50 miles of the kidnaping failed to reveal paper of similar characteristics. Seven days after Dr. Davis had disappeared, a suspect was picked up and a search of his belongings revealed paper of the same type as that on which the ransom note was written. This suspicion was verified by laboratory examination, which also revealed that markings corresponding to writing on the ransom note were impressed on a blank sheet of the writing pad found on Kenyon, the suspect. The identification was completed when the markings were read under parallel light rays. In the meantime, another ransom note was received demanding the $5,000 payment.

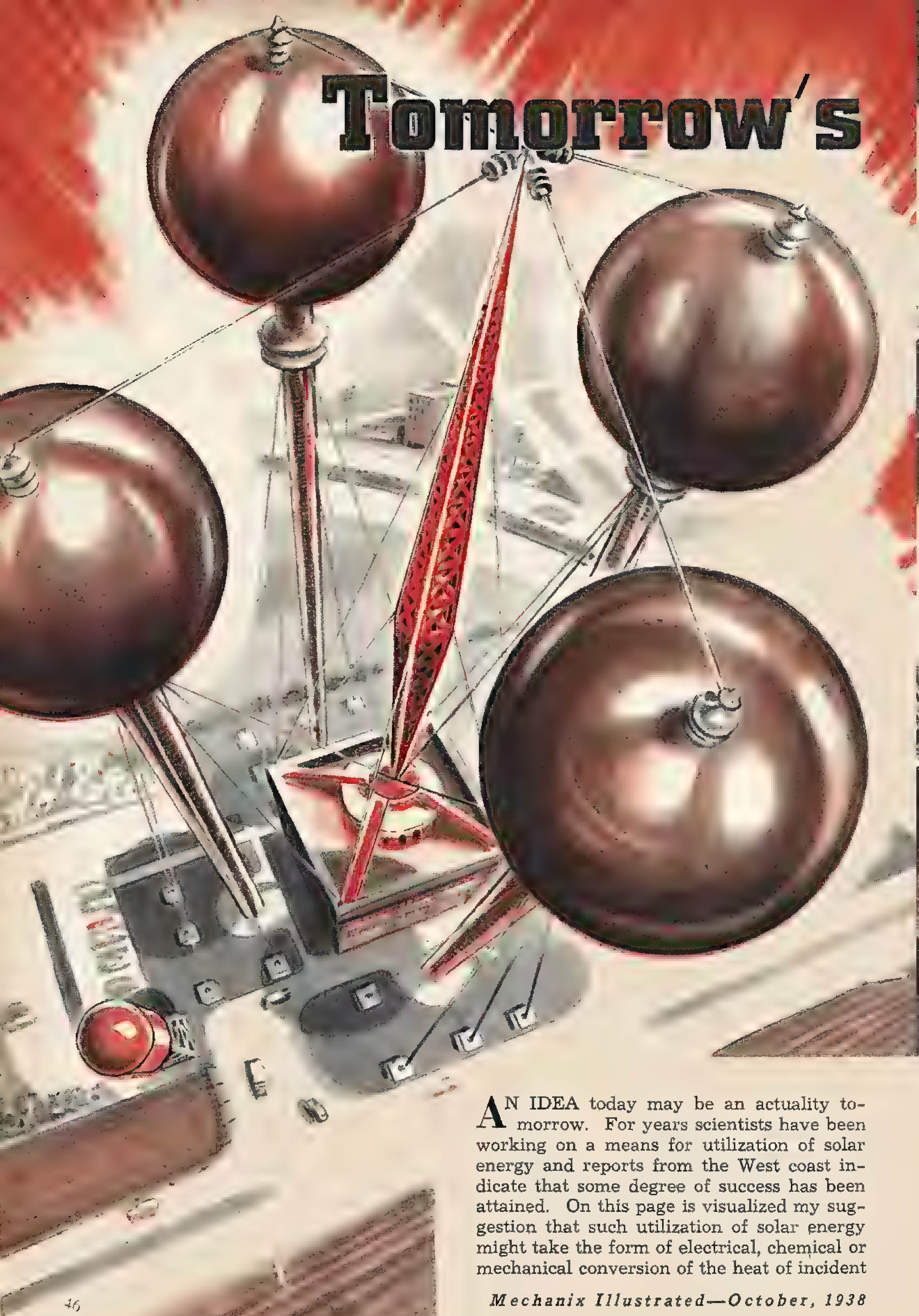
Shortly thereafter G-Men found the body

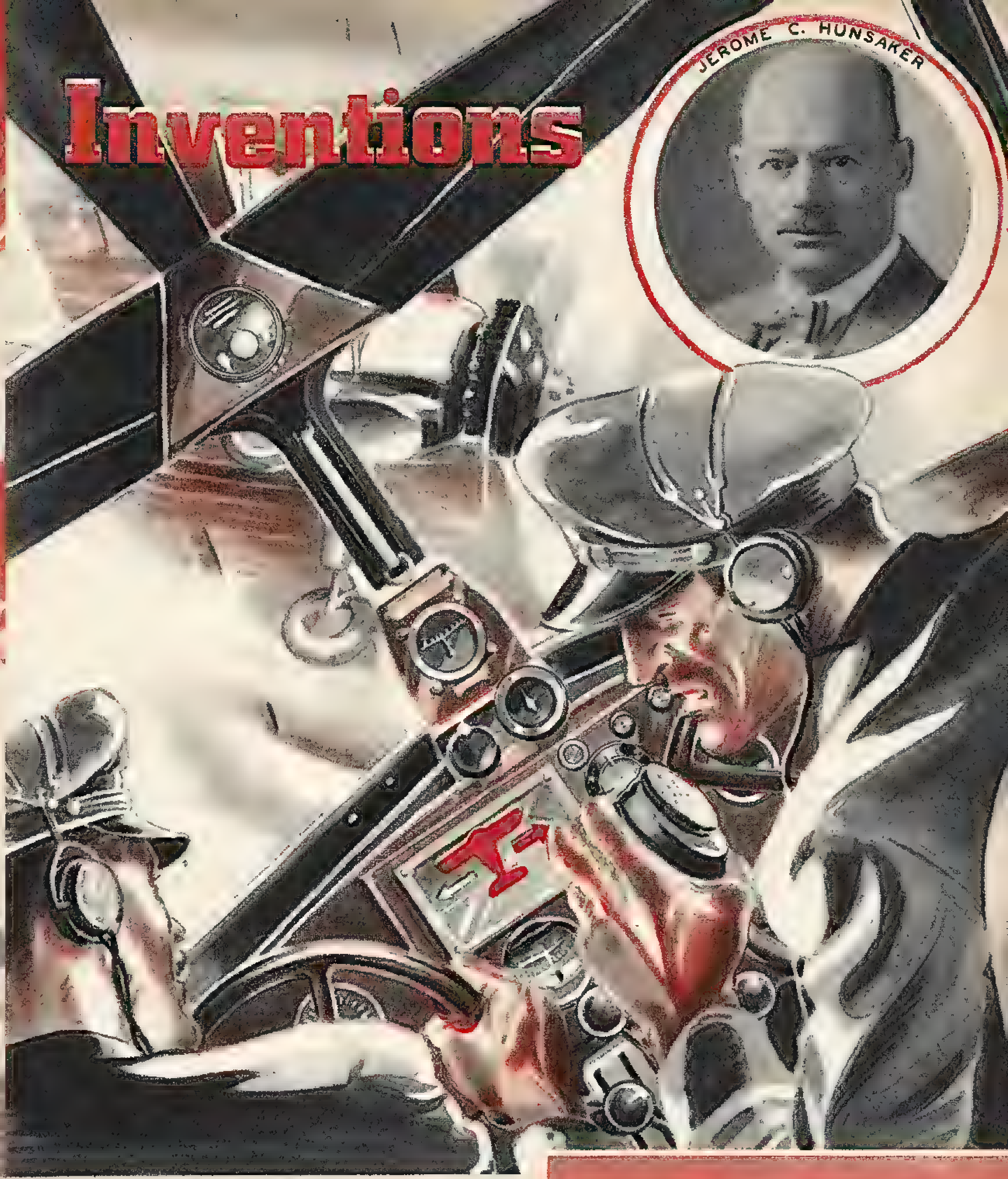
[*Continued on page* 75]

Left: Ultraviolet machines are used by the crime laboratory to discover secret writing. Note the message as it appears dimly between the black lettering. Technician below is weighing paper on analytical balance to discover its characteristics.

Frequently suspect's clothing is examined for traces of blood and stains are sometimes analyzed to determine if they are human or animal blood. Many such analysis mean life or death to the suspect. Technicians are shown using Benzidine solution to determine presence of blood.

Tomorrow's Inventions





AN IDEA today may be an actuality tomorrow. For years scientists have been working on a means for utilization of solar energy and reports from the West coast indicate that some degree of success has been attained. On this page is visualized my suggestion that such utilization of solar energy might take the form of electrical, chemical or mechanical conversion of the heat of incident radiation which is nearer accomplishment than the-man-in-the-street realizes. The illustration on the right visualizes my suggestion for a warning device to avoid collision of airplanes when flying blind. It is not too much to hope for realization of these and other ideas suggested by engineers and scientists whose practical experience indicate a need for new inventions.

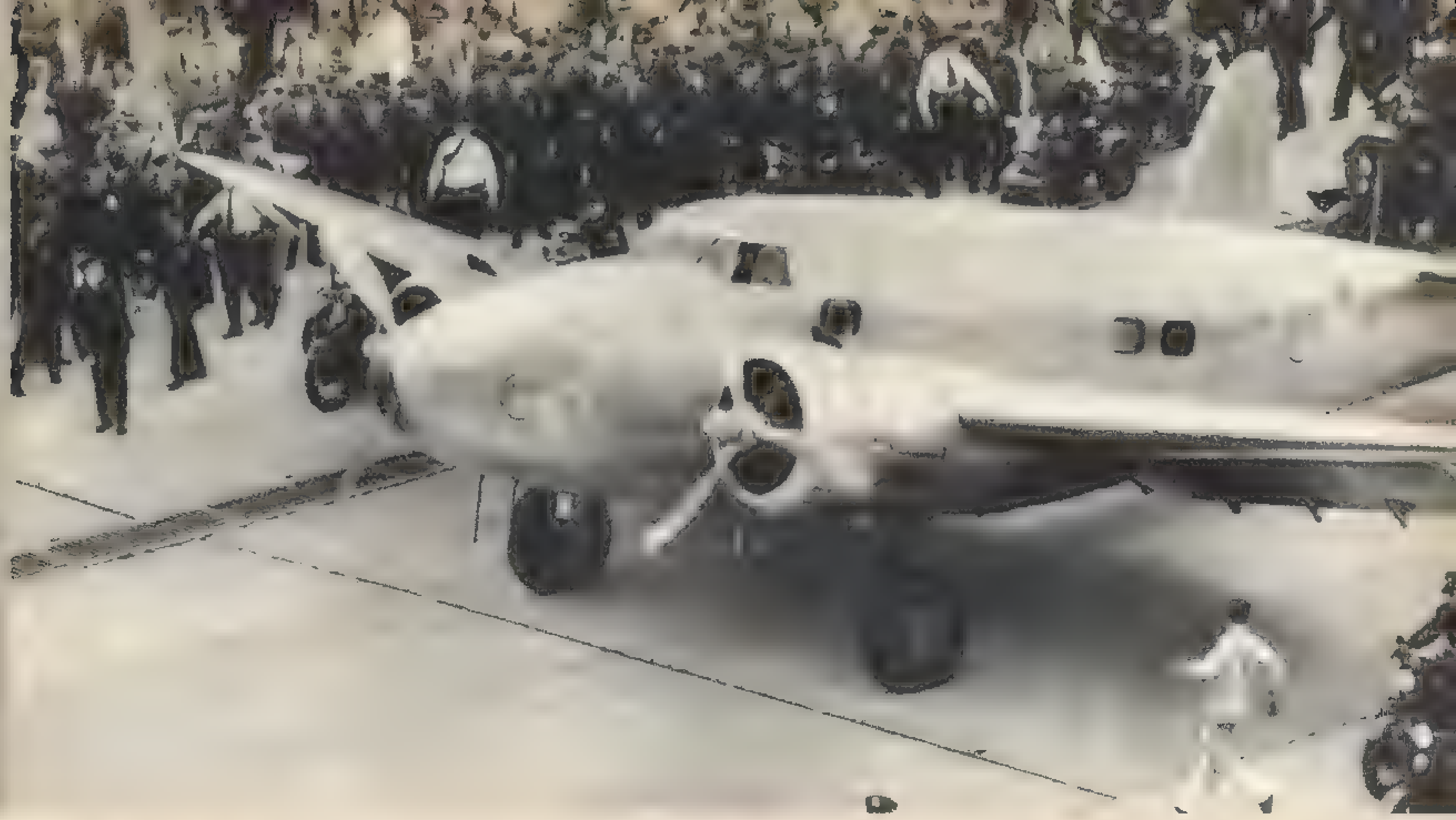
A NOTE ABOUT THE AUTHOR

JEROME CLARKE HUNSAKER is professor-in-charge, department of mechanical engineering, Massachusetts Institute of Technology. He is a graduate aeronautical engineer; was in charge of aircraft design U. S. Navy; developed wire and radio services for airways and has been honored by scientific societies throughout the world.

EXCLUSIVE!

A real "scoop" for MI readers is this detailed report of flight experiences aboard the globe-circling Hughes plane.

The crew. Left to right—Edward Lund, flight engineer, Howard Hughes, pilot, Grover Whalen, New York World's Fair official who greeted the flyers, Lieut. Harry Connor, navigator, Richard Stoddart, radio engineer, and Lieut. Thomas Thurlow, navigator. Notice the battery of microphones.



Hughes Flight Officers' Own Story

As Related by

RICHARD STODDART

Radio Engineer

To CECIL CARNES

Top photo—Howard Hughes' plane taxiing down the runway at Floyd Bennett Airport in Brooklyn, N. Y., having completed a record world-circling flight in 3 days, 19 hours and 8 minutes. Left — Richard Stoddart, radio engineer, tells a radio audience about his thrilling experiences from his New York apartment.

"MAKING the round the world flight under Howard Hughes' leadership was scientifically gratifying and so well planned that we all knew it was safe and that no so-called heroical physical courage was necessary," Richard Stoddart, radio expert, and Harry P. Connor, famous navigator, told *MECHANIX ILLUSTRATED* in an exclusive interview arranged by Albert I. Lodwick, aviation executive and Mr. Hughes' flight operations manager.

"I believe this will be a comprehensive story of what happened on the trip," Mr. Stoddart, the tall, soft-spoken wireless wizard, said, "and the story logically begins many months ago, and not with our take-off for Paris, as the crowd probably believes.

"I know now more than ever before that when Howard Hughes sets out to do a thing he does it with scientific thoroughness and has every right to expect the ultimate in success. There is no use trying to compare him with any other person I know about, now or in history. Well, as I said, as soon as our ideas were integrated an intensive search for the very best equipment was inaugurated.

"We found that some of the technical apparatus which we needed didn't exist. The prime case-in-point is in the matter of the radio instruments. None were available which could handle either the type or range of the work which we wanted to do.

"There was airline equipment, yes. Some of it very good. But we needed something of a far greater technical perfection, so we had to design our own transmitter, which was produced for operation on a wide range of frequencies. You'll realize how wide I mean when I tell you our range was from 330 kilocycles to 23,000 kilocycles. We had seventeen frequencies. It took us several months to design just what we wanted, and then we had to superintend its construction.

"After that there came long periods of testing all of our instruments on the ground and, finally, in the air. But eventually we were satisfied with what we had devised. We found our range was wide and that our transmitter was the best possible for broadcasting at this time.

"We had built close-talking microphones. I call them that because they were designed for talking directly into them, thus eliminating the hum of the motors, the cabinet noises, and the sounds of others working their instruments nearby. And right here let me reveal that Charles Perrine, who handled the radio setup at the World's Fair and could talk to us at any time, told me just now that at no time could he hear engine noise in our talks. This goes for talks we had over on the other side of the world.

"Of course in having this apparatus built we had to consider weight, so the materials had to be of airplane-type construction throughout. There could be no vibration, yet the instruments had to be worthy of withstanding hard usage, and the possible extra-deterioration which comes from travel up where the air is thin. Dampness and possible humidity also had to be guarded against."

Here Mr. Connor, slight, intelligent co-navigator on the flight, spoke from his background of previous spectacular flights, to

Although New Almaden was shut down in 1926, small operators are still extracting some mercury from the old dumps. Every day, eight to ten tons of loose dirt are run through a little power sluicer, where the heavier quartz drops into a bin while the rest is washed away. This amounts all the way from $20 to $100.

At New Idria, Calif., however, there is renewed, large-scale activity. Ex-President Hoover and his brother have bought the properties and installed vast machinery of the most modern type. Four great rotary furnaces and twelve condensing tubes will cook ore brought by electric locomotives from 200 miles of shafts and tunnels.

California, with between 50 and 100 small mines, now produces 92% of the mercury recovered in this country. Nevada is next and Oregon third. Many think the next big strike will be in Oregon. But mercury, like gold, is where you find it—and you may find it anywhere. Cinnabar is freakish. One vein looks as rich as Croesus. The owner's head swims, he counts in millions; then he wakes to find his vein pinched out. Another follows an unlikely stringer, about to give up, when it leads into a rich chimney and he really is set for a nice, tidy little fortune.

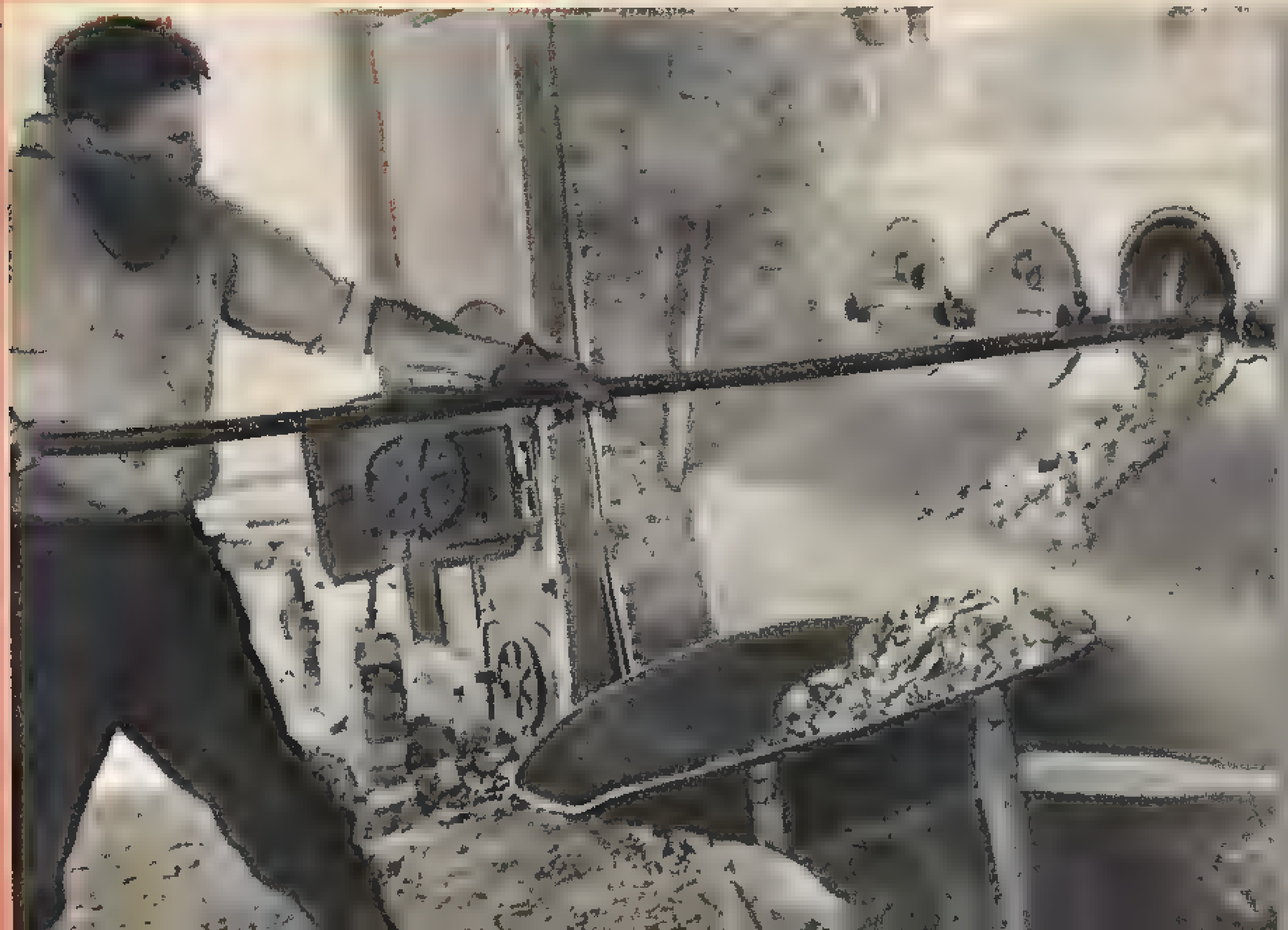
Our most productive small mines are located in Napa and Lake Counties, and there are others in the Santa Lucia Range back of San Luis Obispo. Interesting to note, the patent for the Oceanic, five miles from Cambria, was signed by President Lincoln in 1865.

The name "quicksilver" describes the metal. It is both silvery and quick-running. The only one which takes the liquid form at ordinary temperatures, it has other interesting characteristics. Almost 14 times heavier than water, its weight is so dense that iron floats on it as easily as wood on water. It might be termed a "friendly" metal, for it forms a long list of compounds and amalgams with other chemicals and metals.

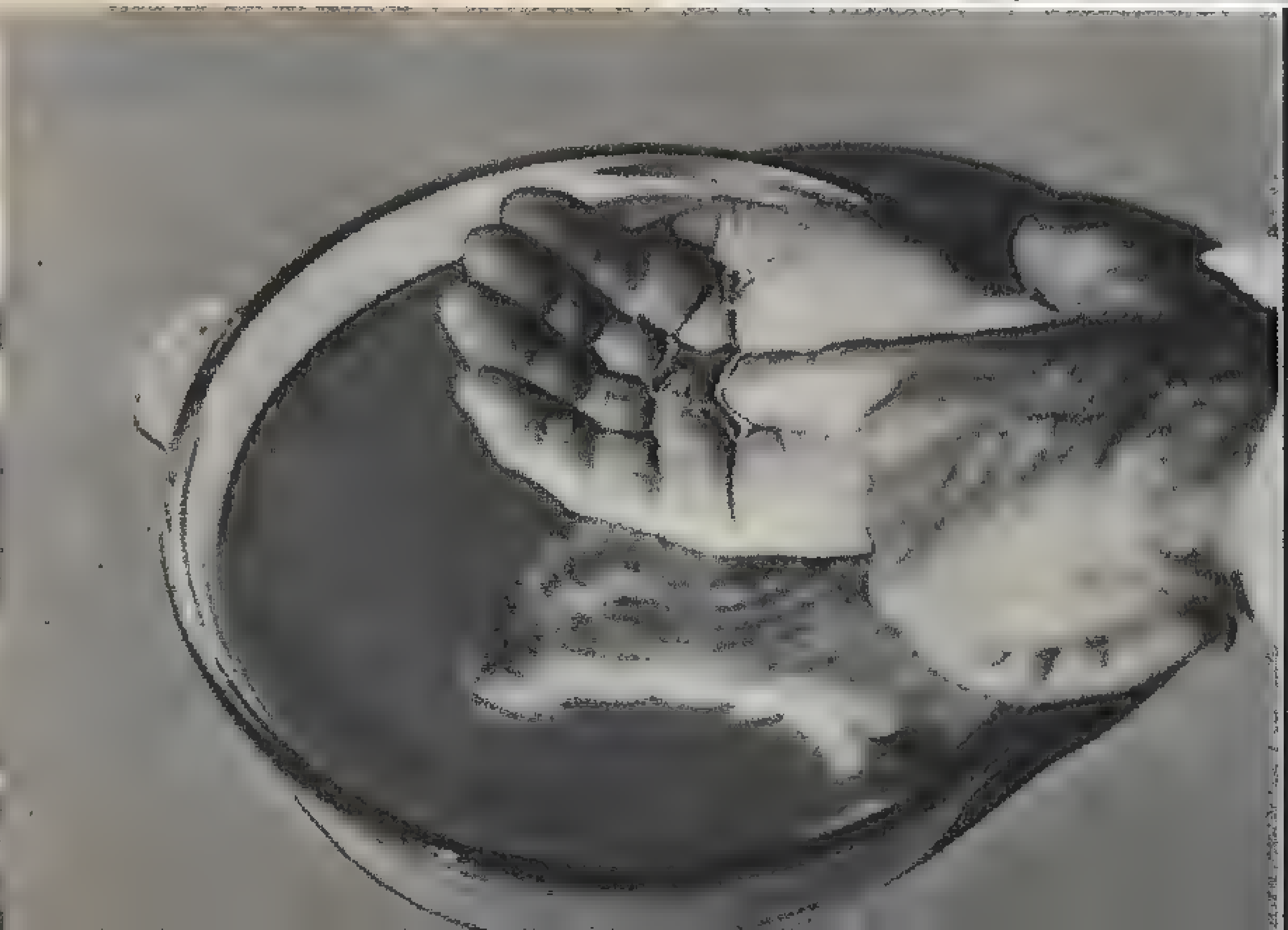
The method of recovering mercury from the ore is really one of distillation, virtually the same as discovered by the ancient Greeks. In fact it is much the same as that by which "Kentucky moonshine" is produced. The ore at the mine is first blasted, then broken into chunks. These are crushed, or "fined," and then fed into huge cylindrical ovens. As soon as the temperature reaches 360 degrees Fahr., the mercury begins to vaporize and at 600 degrees Fahr., the bulk of it has converted to a gaseous state. This vapor is passed next through long, cylindrical condensers which look much like the pipes of an enormous pipe organ. In cooling it takes its final form and trickles out into big iron kettles as a pure, silvery-appearing liquid metal. The slag is passed out the fire end of the furnace.

In today's larger mines, huge rotary furnaces are used, operated under a 1,500-degree flame heat. Most recent development is the Gould rotary. This is a big drum, 60-feet long by five-foot diameter, which revolves slowly as from 30 to 50 tons of crushed ore is heated at one time. But in the "one-horse" mines, many a home-made oven is in comparatively efficient operation, "cooking" several hundred pounds of ore at a time. The

[*Continued on page* 69]



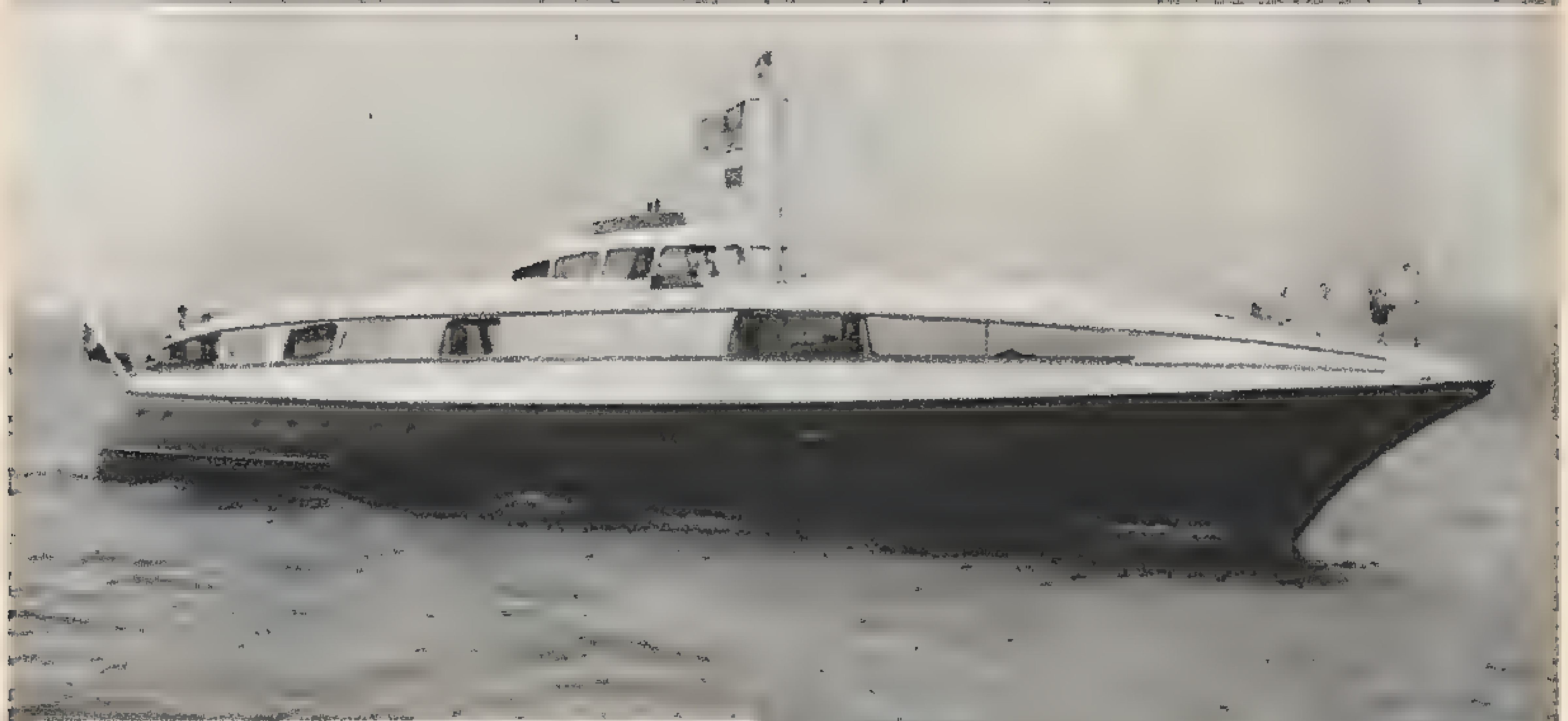
Cinnabar ore is crushed and then "cooked" in open air furnaces. A stoker is removing slag from a reducing furnace at the right. The cloth over his face is to protect him from mercury fumes. After the ore is cooked, mercury vaporizes and is condensed in the huge tubes shown above, after which it is recovered and bottled for shipment.



Mercury is one of the few known metals that may be handled cold in liquid form. Note that it doesn't spread and that it isn't easily soluble. A commercial application of mercury is illustrated above which shows an experimental power house using mercury vapor instead of water to produce steam. Sections of the boiler are visible.

Fokker's "Q. E. D." Has Queer Design

Famed airplane builder designs a streamlined boat using plywood for structural strength and separate power plants for speed and cruising.



Above: The Q.E.D. afloat typifies advanced design in boat building. Its length is 110 feet. Beam measures 18 feet.

"I'VE just built the Q.E.D., a 110-foot pleasure craft with an 18-foot beam, and boat designers tell me I'm crazy," says Anthony G. Fokker, of airplane fame. "The know-alls wag their heads and say that the Q.E.D. is too radical in design. In appearance there is nothing like it, nor in construction, either. But the boat is not radical in design. I may build another boat—and when I do, designers will have something to talk about."

The hull of the Q.E.D. is built of white oak planking. The superstructure, pilot house and interior partitions are of plywood. Plywood beams have been gauged out to reduce weight. The boat has a 4½-foot draft and a cruising speed of about 16 knots. Power is supplied by a Vimalert oil engine developing 800 hp. at 2,100 r.p.m. Two Capitol-Wright engines, later to be replaced by Wright airplane engines, will give a maximum speed of 35 knots. Engines are rubber mounted on light plywood frames. A V8 engine will supply power for auxiliary purposes.

The pilot house is equipped with electric controls coupled for remote control. Roof of the house may be raised for ventilation. A trap in the roof over the covered boat deck may be raised for loading purposes.

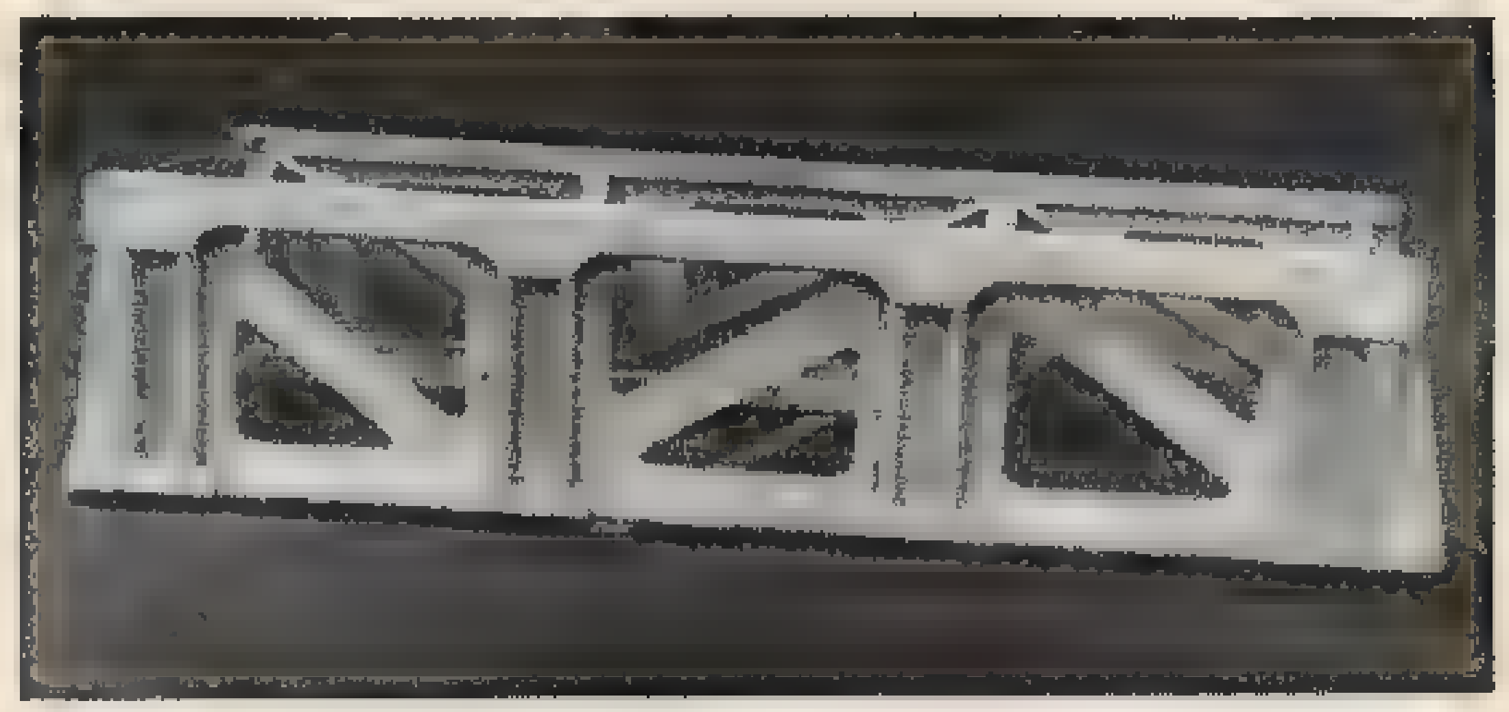
The Q.E.D. is equipped with two cabins fore and two aft, a library and stateroom, and has crew's quarters for six.

The boat has an off-center mast that is collapsible, an automatic pilot and compass, special stabilizer and anchor. No smokestack protrudes above the pilot house. A ring of louvres extending a foot above the roof will direct the air current upwards, carrying the engine exhaust with it.

The crusier was designed for comfort, utility, and economy. Tests runs have resulted in only slight changes here and there.

"Total weight of the Q.E.D. is 60 tons," says Mr. Fokker. "Special designing reduced its weight tremendously. Plywood engine beds alone cut the weight of a ton."

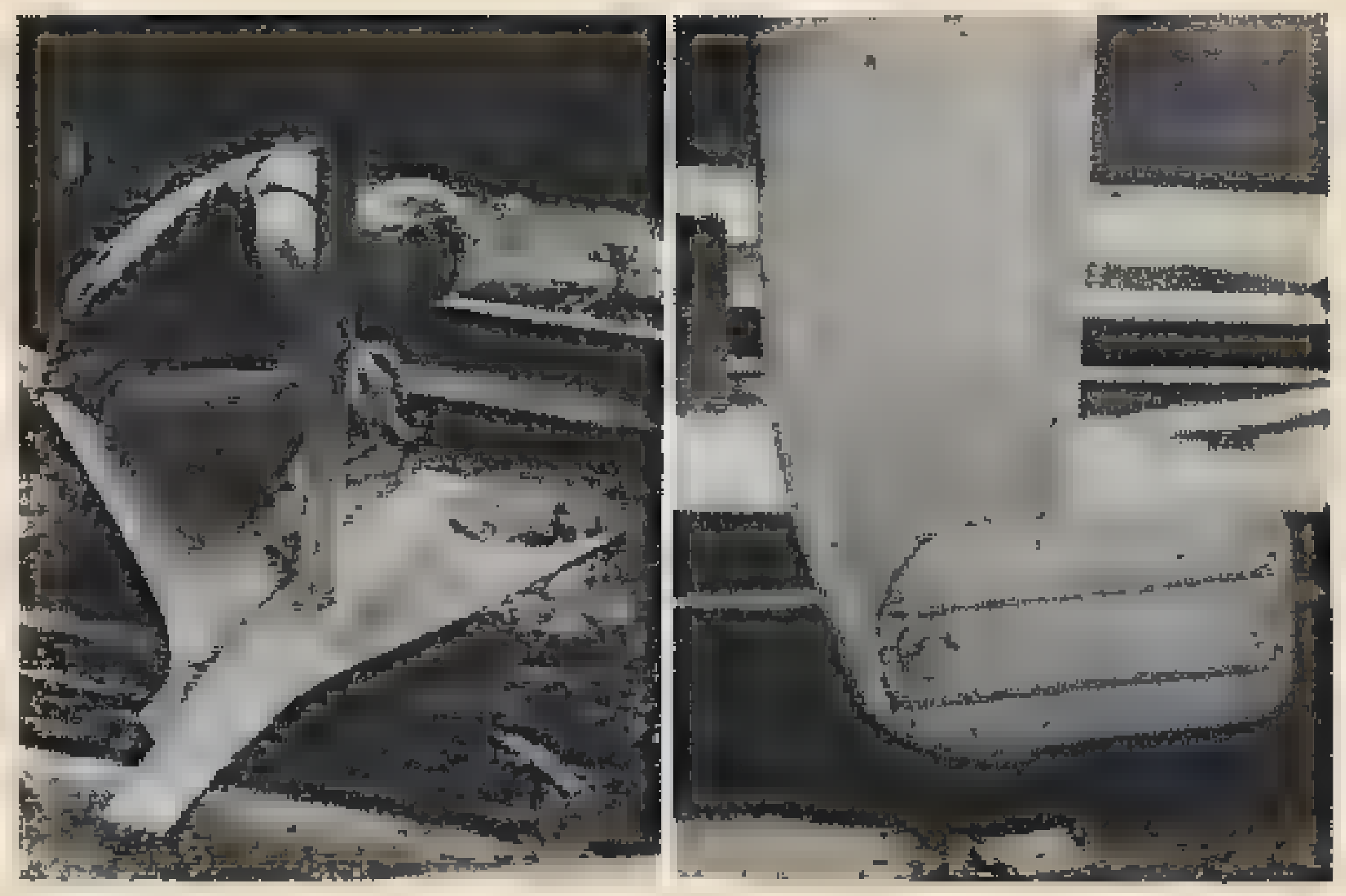
The off-center mast is collapsible. The roof of the pilot house raises 6 inches for ventilation. Note smokestack louvres designed to create upward air currents to carry off engine smoke. All exhausts are through this stack.



The unusual construction of the engine beds is illustrated in this plywood base. Note that plywood sides have been gauged out. Total weight is 40 pounds for each bed, reducing the weight over original beds several hundred lbs.

The engine room of the Q.E.D. is all engine. The center one is an 800 hp. diesel. End ones are 600 hp. Capitol engines.

Anthony G. Fokker, airplane-designer-gone-boat-builder, is shown in the control room of his "crazy" craft. The big stick on the left controls the special stabilizer shown below.



The specially designed anchor (above, left) drops from the bottom of the boat. At the end of the shaft is an anchor chain. The protruding end of the stabilizer is shown at right. It protrudes, through a shaft in engine room, below the keel.

QUICK ON THE DRAW

Some of the Los Angeles police department's crack shots are shown working out on the Elysian Park range. Each man must shoot a minimum score monthly. Failure to qualify requires spending extra time on the range.

These are the targets in the Elysian Park range where crack shots work the kinks out of their trigger fingers. Good marksmanship is rewarded by bonuses up to $16 monthly. They train constantly in order to stay in the money.

America's 1937 National Individual Pistol Champion tells how a sensitive trigger finger once saved his life as well as won him national fame as a pistol sharpshooter.

by Lt. Emmett E. Jones

"GIVE me your poke, buddy," growled a dark figure as it approached from behind a tree one black night. I was sitting in my car and he thrust the gun in my side.

"I've no wallet," I answered, "but I have a little money in my pocket."

"Keep your hands on the wheel," commanded the bandit.

He took $13 in currency from my pocket, then ran his hands under my coat in search of a weapon. Fortunately he didn't reach far enough to discover the regulation police .38 hanging from its holster at the right. Then he drew the watch from my vest pocket and began to pull on the gold chain.

On the other end of the chain hung my badge. I knew that the instant the bandit found that, he would probably "let me have it," right there, for his confident manner made it plain that he was an old hand at the game and doubtless had old scores behind him.

Meanwhile, however, I had been letting my hands creep very slowly downward on the wheel until my right-hand finger tips touched my holster. In another instant he would find the badge and the game would be up. But I figured that on the show-down if I could get in one good shot it would give me a fighting chance.

As the bandit centered his attention upon the watch, his left hand, holding the gun, wavered a little. That was my cue. Lashing out with my left, I knocked the gun barrel downward. At the same time my fingers closed on my own gun; I drew and fired one quick shot. And that was that.

I was lucky, for investigation showed he was a thoroughly bad-egg—a "three-time loser," and would have no compunction whatever in killing me. I can thank long hours on the target range for that confidence which helped me take a long chance on a single shot. For once I realized that there was something more than winning competition in being a crack shot and I sure was glad I was a champion at it. Suppose I had missed . . .!

The only time a bad shot ever did me any good was when I won the 1937 pistol meet at Camp Perry. At the time I thought one miss was pretty good shooting but tonight I realized how fatal one bad shot might have been.

How did I win a match on one bad shot? It happened late one autumn afternoon as I stood in a lineup with a hundred-odd other contestants, facing a long row of targets behind which glimmered the waters of Lake Erie. It was the final series of matches in the annual National Pistol Competition, conducted by the War Department at Camp Perry, Ohio. More than 700 of the nation's best shots, recruited from all branches of Government service, police departments, and some civilian groups, were shooting for the title of National Individual Pistol Champion. The competition was gruelling, the events

Lieut. Emmett E. Jones is shown holding one of his favorite pistols. A few medals won in competition appear in the background. What it takes to be a champion is explained by the champ in this story.

Trophies won by Lieut. Jones in competition are shown here. Large figure represents a sugar cane cutter and was won in the Pan-American International meet. Note General Custer trophy amid the other cups.

moving along with military precision under the competent direction of Army and Marine officers, one of whom stood behind each pair of contestants, to make sure that all rules were observed and that nothing but regulation Army ammunition was used.

The War Department wastes no time. Promptly the officer in charge barked out an order:

"Slow fire—ten shots, one minute per shot!"

Simultaneously all the targets revolved on their pivots and stopped facing us. A crackling, desultory barrage of shots sputtered and died. Then the targets whipped round from sight.

In a moment came a second command: "Time fire—five shots in twenty seconds!"

Another barrage, another deafening silence.

Then a third command: "Rapid fire—ten shots in groups of five, ten seconds per group."

As the tempo quickened and the firing blended into a mighty, continuous roar, my first four bullets streaked towards the center of the target, and splattered into the "9" and "10" rings. As my trigger finger automatically reached for the final shot, I felt a sudden unaccountable impulse to empty my gun, and to do it quickly. I did exactly what I had spent months learning *not* to do—I "helped" the trigger by giving an imperceptible quick jerk.

That tiny movement was just enough to spoil an excellent aim. The fifth bullet went flying low into the "6" ring.

As the target flipped from sight, the Army officer behind me spoke.

"You were doing very nicely until that last shot," he commented.

"Yes," I growled, between clenched teeth. Then black fury overcame me and I added: "—and I'm going to put the next five shots into the black if it's the last thing I ever do!"

In cold anger I waited until new targets rose to position and suddenly flipped forward again. Taking a cool, deliberate aim, I fired, bearing down on the black bull's-eye as if to bore straight through it by the very thrust of the muzzle.

One, two, three, four, five—and the center of the card showed a cloverleaf hole in the inner rings—a nearly perfect score!

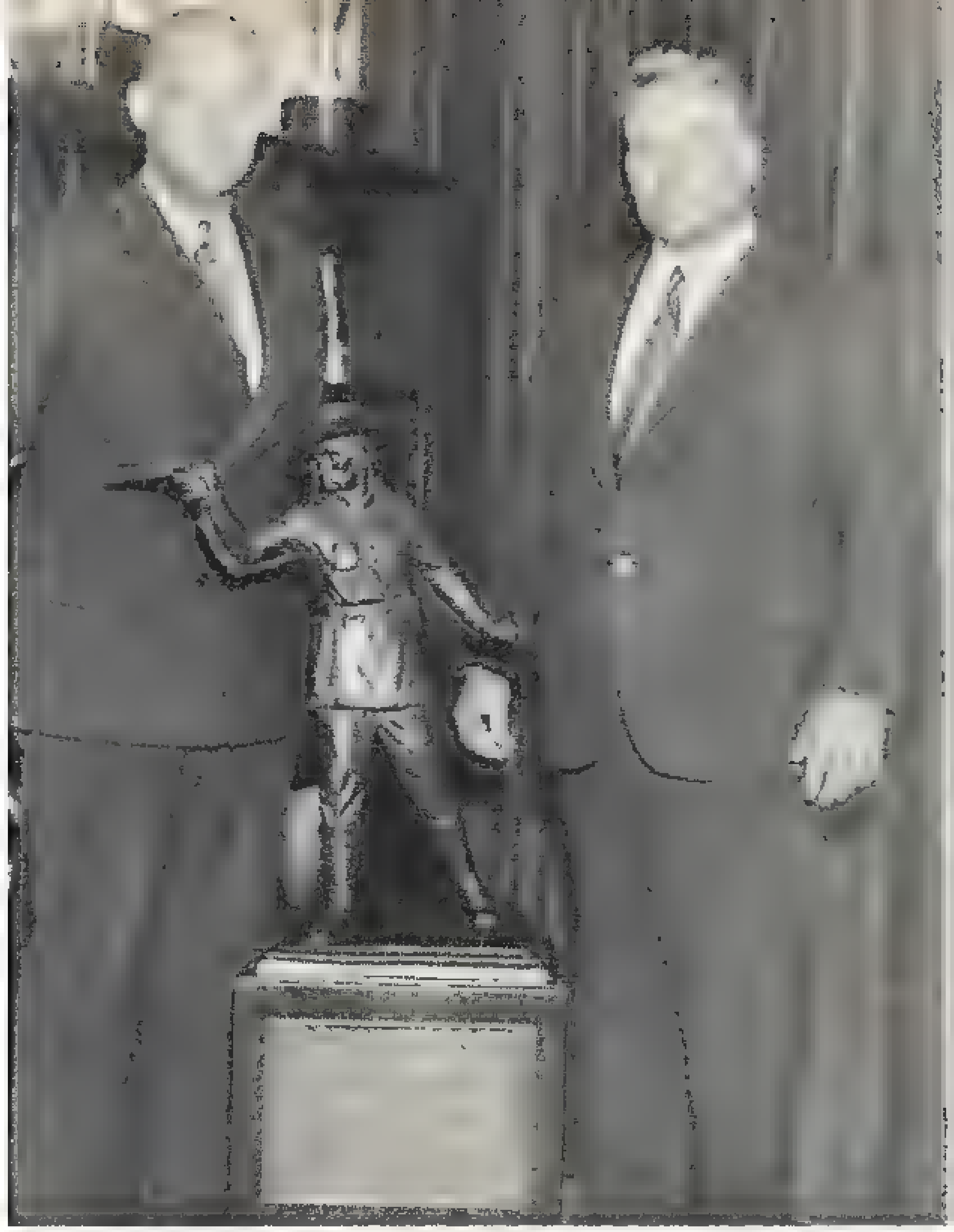
As the next relay of contestants took our places on the firing line, I made a bee-line for the judges' stand, and anxiously scanned the showings already chalked up, looking for the "hot shots" who, I knew, would probably place highest. So far no one had rated higher. When the last volley had died away, and still nobody had bettered my score, I knew I had won. And the lesson came home to me with thrilling force: Don't let one bad shot spoil your game!

I honestly believe that if I had made a perfect score, the realization would have spoiled the cool, determined concentration which is absolutely essential to accurate pistol shooting.

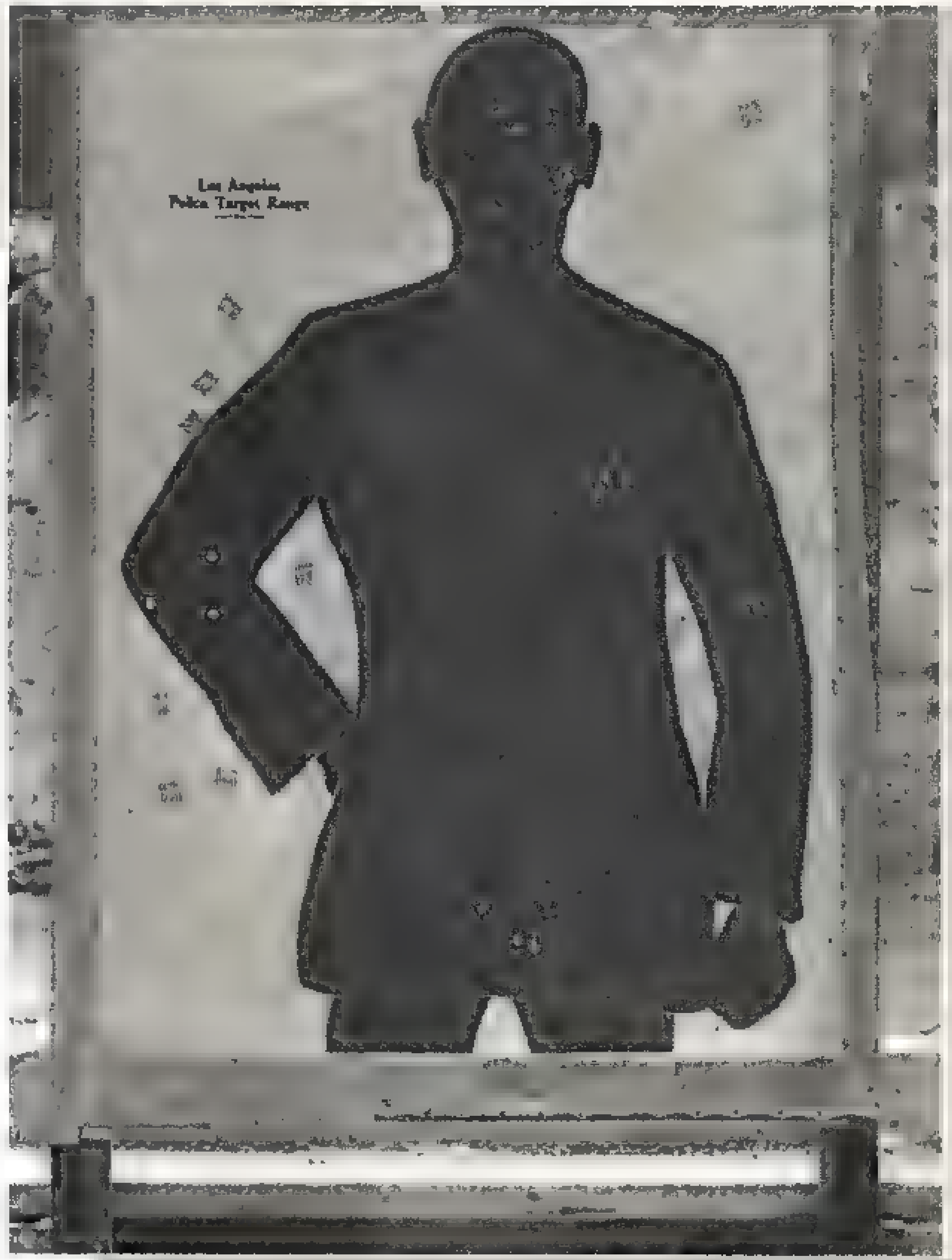
Concentration—that's the fundamental secret of markmanship. Even a tyro may make an occasional bull's-eye, and the most experienced sharpshooter sometimes gets off his stride; but give me the man who forgets everything else in the world when he looks down along a pistol barrel.

You don't have to be born with a silver bullet in your mouth, nor cut your teeth on a gunstock to climb right up the ladder to top rank of markmanship. Only moderate natural ability is needed if you are willing to set aside a regular time for training yourself. Consistent practice—perhaps only a few minutes a day, but continued over long periods of time, will do wonders for any one, particularly if he has the enthusiasm to keep himself keenly alert after the thrill of shooting has lost some of its novelty.

During the 1937 Camp Perry match, the National Riflemen's Association selected fifty outstanding slow-fire pistol-shots from among the contestants, then staged an elimination contest to choose a ten-man team of American marksmen to meet a corresponding British slow-fire team. Of the ten who ranked highest, five of us were Los Angeles police officers—and later our team won the International match by 120 points. To my mind there's clear proof that consistent training over a long period of time unfailingly turns up a large percentage of first-rate marksmen.



Lt. Jones is shown with the General Custer Trophy which he won at the Camp Perry meet. This trophy is re-awarded each year by the War Department. Jones may have retained or lost it for 1938 by this date.



This target shows the effect of good pistol shooting. Note how bullets have reached vital areas of the figure: groin, elbow, heart and head—easy enough to do on a still target, but how about a moving figure?

Some pistol shooters like to go on an occasional orgy of practice, especially when an important competition is coming up. I think they do themselves as much harm as good. It's the old hare-and-tortoise story—the fellow who creeps, but keeps plugging along gets farther in the long run. It's too easy to "go stale."

Personally, the week before a match, I like to shoot about ninety rounds a day—thirty in slow fire, thirty at a time, and the same at rapid fire. That gives me three times over the course, without overtaxing wrist or arm muscles.

Correct stance—weight evenly distributed on both feet, the body at an angle of about 45° to the line of fire, the arm extended straight without undue tension; a confident frame of mind, good eyesight, correct breathing, and plenty of the right kind of practice—these are the necessary ingredients of good pistol shooting. Of all these, none is more important than correct breathing.

In slow fire, fill your lungs; let the air out; then take about half a breath before firing. This puts your muscles

[*Continued on page* 79]

What About The Airship?

by
Comm. C. E. Rosendahl,
U. S. N.

Inflated with non-inflammable helium instead of hydrogen, airships of the future will be safe from the fire peril that ended the career of the *Hindenburg*, above.

"THE fate and future of the airship the entire world over rest unmistakably and unescapably upon the shoulders of the United States of America. A combination of circumstances and natural factors has saddled Uncle Sam with this responsibility. It is one that he can convert to his everlasting glory; it can, on the other hand, become a hardly creditable chapter in our aeronautical history, unless we recognize the true facts and meet the situation squarely. The fate of the airship can be either extension or extinction. That Uncle Sam should turn quitter and resort to extinction of the airship hardly seems an American trait. Granted extension, it is my opinion that the future of the airship is a bright one.

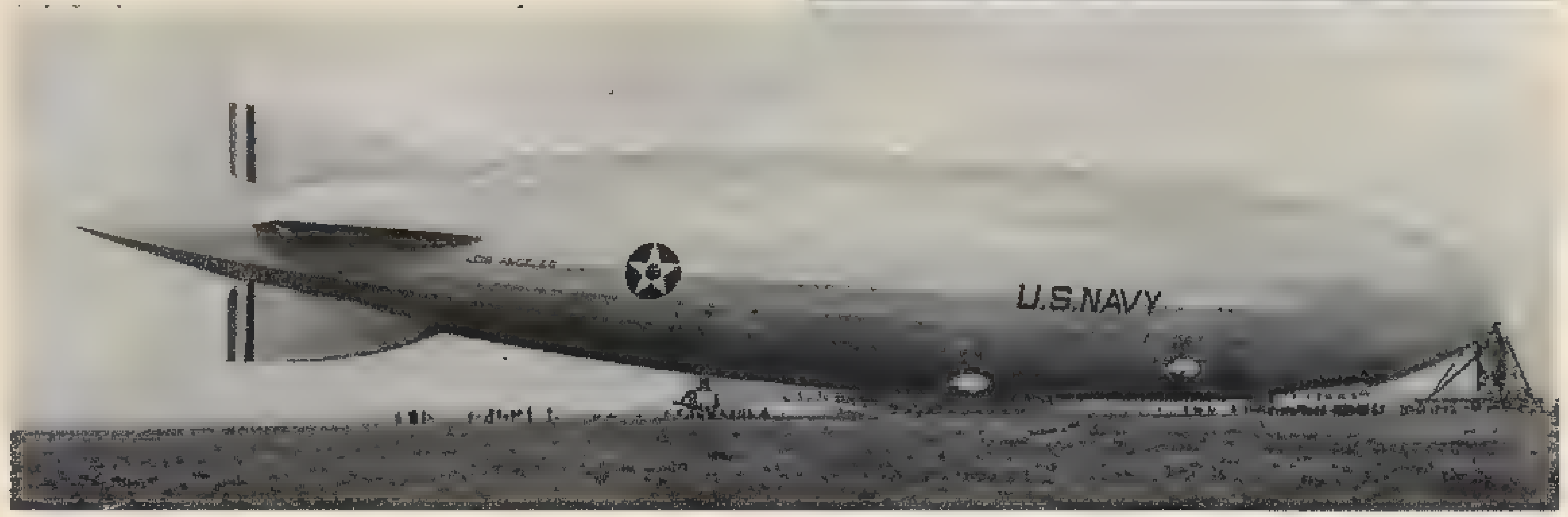
"The biggest stumbling block in the path of airships today is misunderstanding. There is but a comparative handful of people in the world today who have first-hand knowledge of them. Almost invariably, the airship critic who is inspired only by honest doubt will, when backed into the corner, admit that his ideas or opinions are based on second-hand information and hearsay. *It is a most significant fact that every organized group—scientific or lay—that has yet investigated the airship has found much in its favor.*

"The points in today's situation that seem so unfair to the airship are the unwillingness to accept the airship as a proven oceanic carrier available *today;* the unwillingness to grant that the airship will retain a place in oceanic transport when the airplane also eventually achieves that field; an almost crusading fervor to credit the airplane with nearly unlimited possibilities of development, at the same time ignoring improvement in the airship; and a desire to keep the airship out of the picture while we await realization of airplane dreams.

"The inherent advantages of comfort, safety, etc., of the airship over the ocean flying boat, together with the fact that today the non-stop airship can span the Pacific in *one-third less total time* than the flying boat service, entitle the airship to remain in the picture. Are the *Graf Zeppelin's* 590 flights, 1,053,391 miles, 13,110 passengers, 235,000 pounds of mail and other cargo, and 144 ocean crossings to be regarded only as 'gestures'?

"Once more I feel constrained to emphasize that whether deliberately or accidentally engendered, the destruction of the *Hindenburg* by fire does not legitimately raise any question as to the basic safety and merits of airships employing non-inflammable inflation gas. The loss by fire of the steamships *General Slocum* with 1,021 lives in 1904, and the *Morro Castle* with 122 lives in 1934, did not condemn steamers as a type. Within three months after the airship fire, the newspapers had reported several fires occurring in commercial airplane operations, and the loss of more lives than in the *Hindenburg;* yet no one questioned the merits of airplanes just because of these unfortunate fires. Had she been inflated with helium, the *Hindenburg* could never have met such an end. Up to the moment of her consumption by fire, this ship had been a decided success, and had added to the laurels of German commercial airships already won by the eight years' operations of the *Graf Zeppelin.*

Commander C. E. Rosendahl, U. S. Navy, is America's No. 1 airship authority. He commanded the *Los Angeles* and *Akron* airships and acted as observer on flights of the *Graf Zeppelin* and *Hindenburg.*



The U. S. Navy airship *Los Angeles* at her mobile mooring mast at the Lakehurst, N. J., naval base.

"From the fuss and fury with which they have so often been surrounded, one might

[*Continued on page* 138]

MI'S "BOOK OF THE MONTH"

Every month several meritorious books are published which the editors believe are of special interest to readers of MECHANIX ILLUSTRATED. We know, of course, that you may not be able to read them all, and for that reason we plan to select the outstanding book of the month and present here an extract from it. The books will be chosen for their special interest in the fields of adventure, travel, sports, science, mechanics and history. The episodes selected will be of some complete dramatic or informative incident.

Readers who wish to obtain these books to be read in their entirety may order them from local book dealers, or by mail from the publishers. Every volume from which we will select an extract will form a lasting, worthwhile addition to your library.

"What About the Airship? The Challenge to the United States", by Commander C. E. Rosendahl, U. S. N., is our choice for October. The publisher is Charles Scribner's Sons, 597 Fifth Ave., New York, N. Y. Price is $3.50.

MI Readers' Service Bureau

THE MI Readers' Service Bureau was started for the express purpose of making MECHANIX ILLUSTRATED a more valuable magazine for its readers. The editors of MECHANIX ILLUSTRATED have felt that too many readers overlook the value of the advertising columns and hence miss many valuable opportunities. After all, many advertisers spend thousands of dollars every month on booklets and literature to supply you with interesting material on their products and related subjects.

MECHANIX ILLUSTRATED censors its advertising stringently for your protection and therefore urges you with full confidence to take advantage of its columns and the many attractive offers made in them.

To bring them to your attention and to simplify your obtaining information from the advertisers you select, all the offers made in this issue, with the exception of those in the classified section, are listed on this and the opposite page.

It is the function of the Readers' Service Bureau to act as a clearing house for both readers and advertisers. The listing gives offers made, the cost of each, and a convenient identifying number. To simplify the ordering of booklets, samples, catalogs, etc., the bureau will forward your requests to three or less of the firms listed.

Merely write your name and address on the coupon, mark the number of the offers wanted, and mail the coupon either in an envelope or attached to a post card. The Readers' Service Bureau will do the rest. It is important that you refer to the advertisement itself before ordering booklets or other material. To simplify this, the page on which the advertisement appears is listed in the right hand column.

If the offer selected is listed as "free," all you have to do is to send in the correctly marked coupon. If there is a slight charge (usually only 3 cents and rarely more than 10 cents to cover the cost of mailing bulky catalogs, booklets or samples), be sure to include the correct amount with the coupon. When postage stamps are used instead of cash be sure to send only U. S., because foreign stamps are not accepted for postage in this country.

Remember that the MI Readers' Service Bureau was started for your benefit. Use it and profit thereby.

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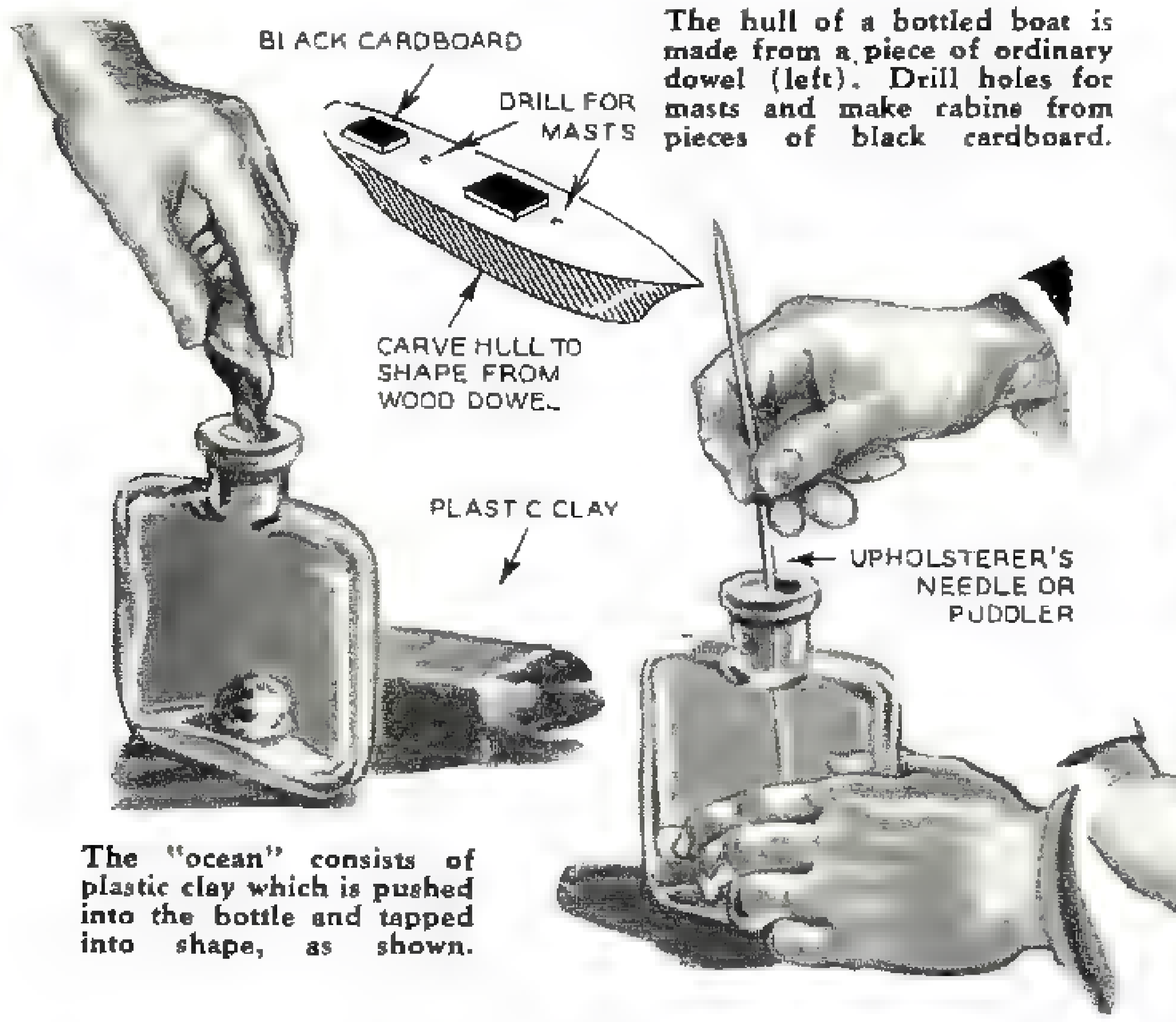
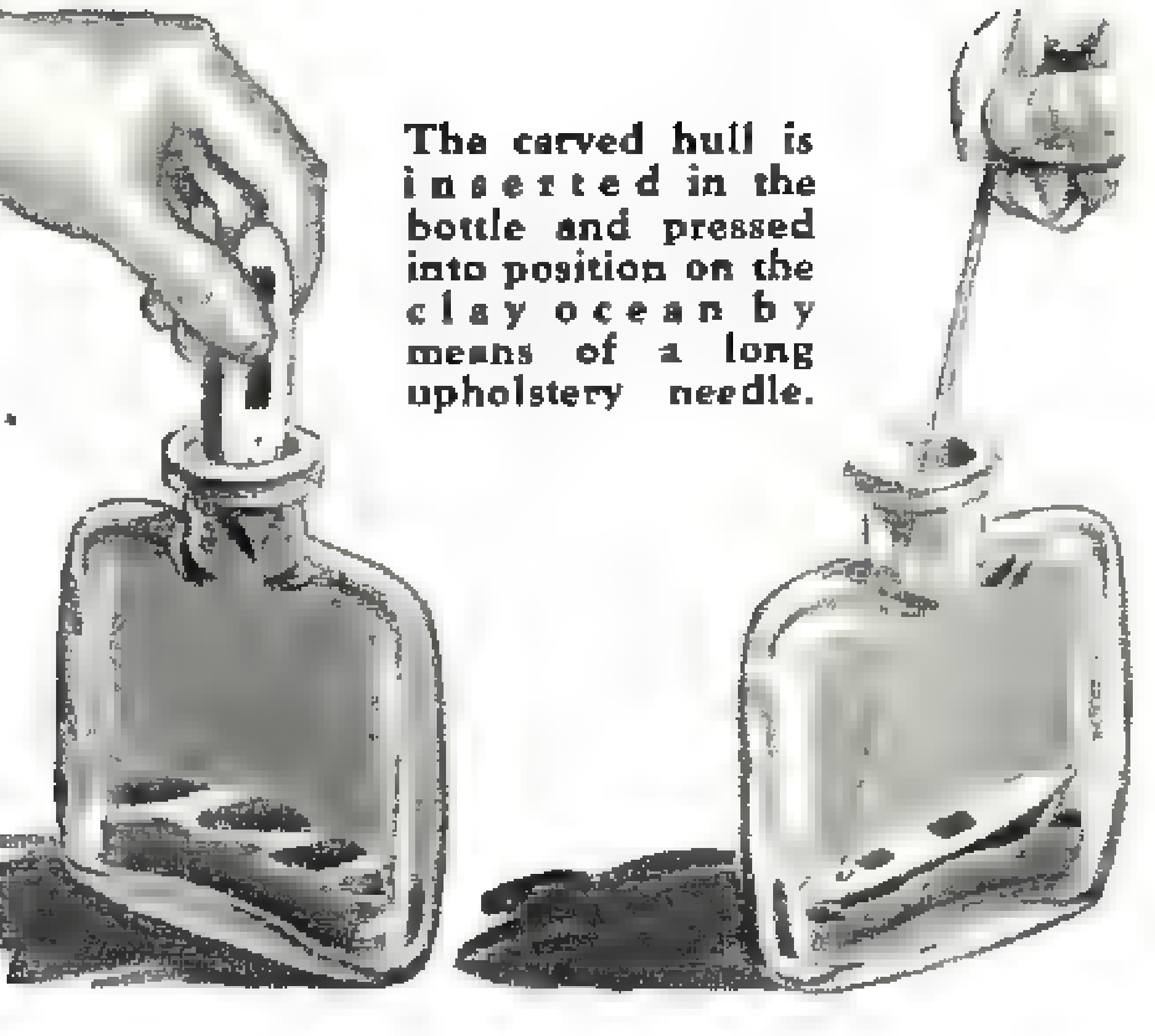
Shown at the right is an interesting display of novel bottled boats made by the author according to the instructions appearing in this article.


BLACK CARDBOARD
DRILL FOR MASTS
CARVE HULL TO SHAPE FROM WOOD DOWEL
PLASTIC CLAY
UPHOLSTERER'S NEEDLE OR PUDDLER

The hull of a bottled boat is made from a piece of ordinary dowel (left). Drill holes for masts and make cabins from pieces of black cardboard.

The "ocean" consists of plastic clay which is pushed into the bottle and tapped into shape, as shown.

Building Bottled BOATS



The carved hull is inserted in the bottle and pressed into position on the clay ocean by means of a long upholstery needle.

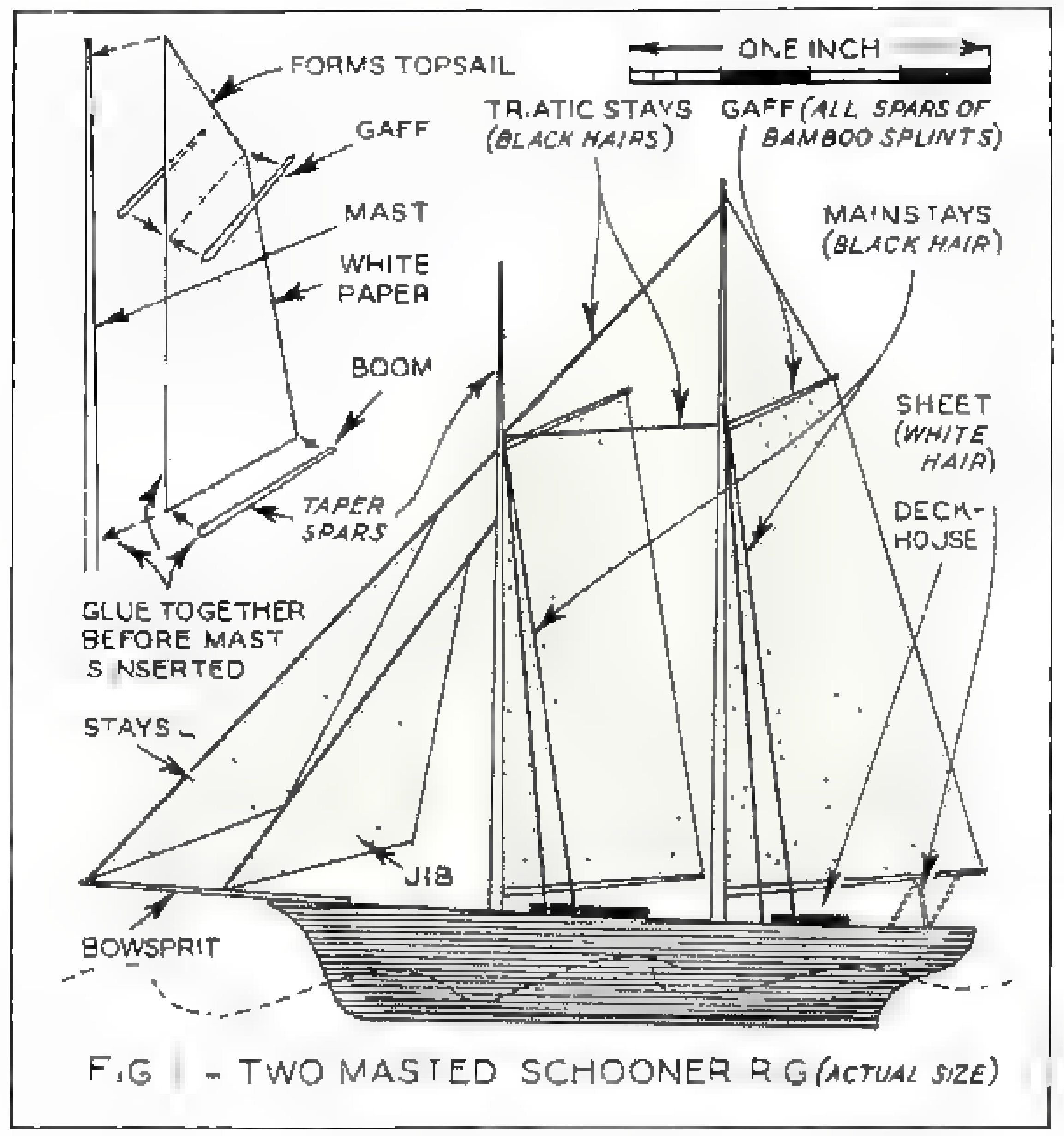

FORMS TOPSAIL
ONE INCH
GAFF
TRIATIC STAYS (BLACK HAIRS)
GAFF (ALL SPARS OF BAMBOO SPLINTS)
MAST
WHITE PAPER
MAINSTAYS (BLACK HAIR)
BOOM
SHEET (WHITE HAIR)
TAPER SPARS
DECK-HOUSE
GLUE TOGETHER BEFORE MAST IS INSERTED
STAYS
JIB
BOWSPRIT

FIG. 1 - TWO MASTED SCHOONER RIG (ACTUAL SIZE)

Shown above are the hull outline and sail patterns of a two-masted schooner which, because of its simplicity, should be your first bottled boat project. See text for details.

by Van Ness Taylor

THE captivating hobby of building model boats within the confines of small bottles is not as difficult as it appears at first glance. All that is needed is a steady hand and a little patience. With a surprisingly small amount of practice you can decorate your mantlepieces, tables, settees and so forth with a large variety of ships in bottles of every size or shape. Your fifth boat will be presentable, your tenth satisfactory and your twenty-fifth salable. Your initial investment will run about ten dollars for the first fifty boats, whether for yourself or your kiddies, but after that the cost of production is practically nothing.

First buy a dozen or so flat-sided, clear half-ounce bottles. Other essential materials are: one long and thin upholstery needle, a pound of plastic or non-hardening clay, a tube of quick-hardening, transparent glue, a package of bamboo strips obtainable from any model airplane supply house, a knife, a dowel of wood of a diameter which will enable it to slip through the neck of your bottle, one pair of tweezers, some white writing paper for sails, some colored paper for flags and pennants, some paints, a large paint brush, a shaving brush, a number 70 drill, a strip of black cardboard, and a pair of scissors.

Make your first boat a two-masted schooner, but before starting get a silhouette of such a vessel to follow. An illustration from a book on ships is the best, but one from a magazine will do.

Begin with the hull, which is carved out of a dowel. Fashion the bow and stern with some care and shave the deck down reasonably smooth, but disregard the bottom as it will never show. Drill two holes in the hull in the proper locations for the masts in accordance with the picture you are following. Now cut two small oblong bits of black cardboard and glue them into place for deck houses. Then paint the hull whatever color you prefer and set it aside to dry.

While the paint is drying make the "ocean" out of clay. Twist off little lumps of it and wheedle them between thumb and forefinger until they will fit through the neck of the bottle. Drop them in one at a time and tap each one down fairly solidly with any blunt instrument, such as the butt of a knitting needle. Your ocean should cover the entire bottom of the bottle, about an eighth of an inch in depth.

[Continued on page 134]

When making square-rigged bottled boats, the sails should be built up as shown in sketch at right. Below—a single-masted exhibit.

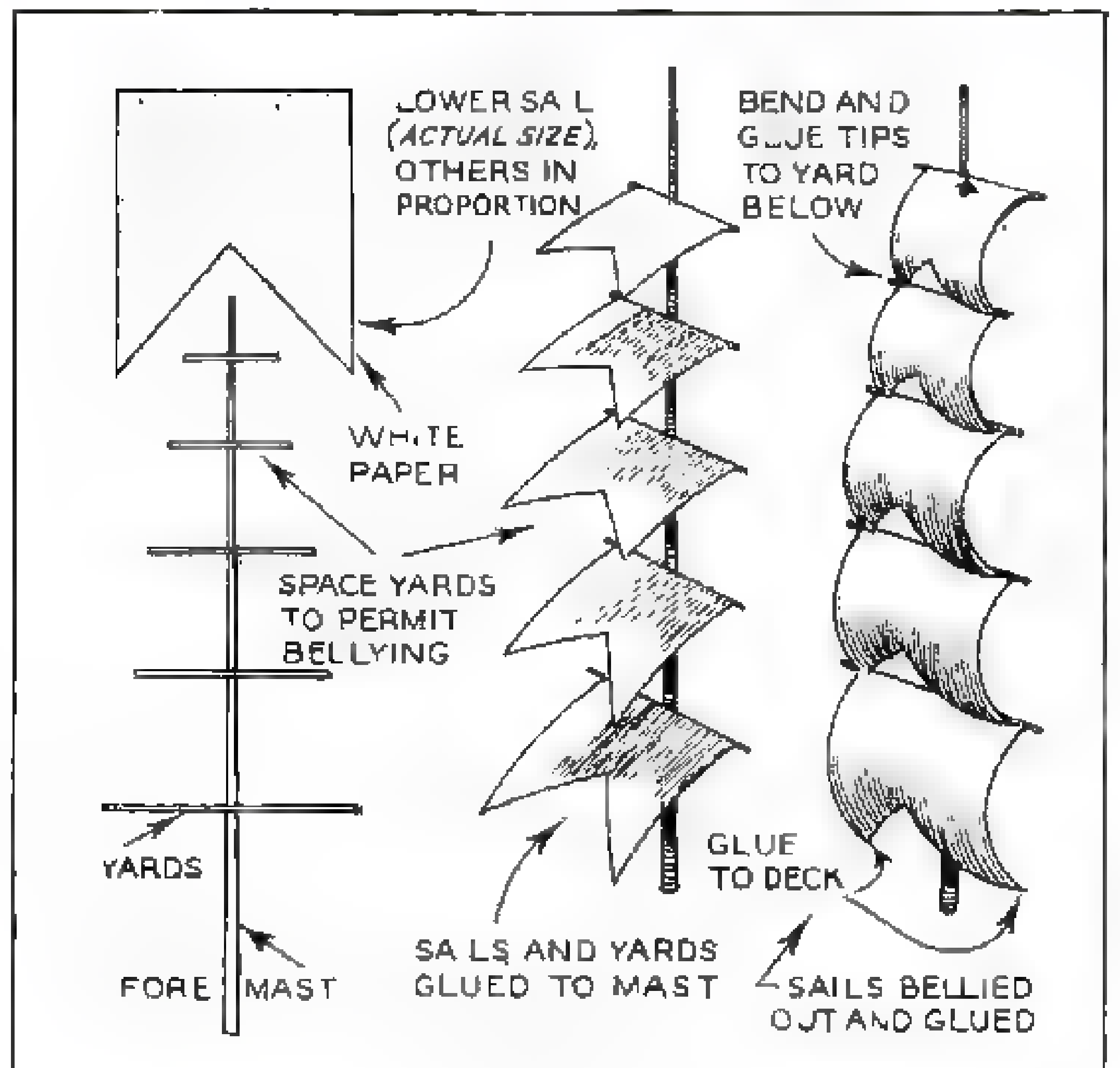
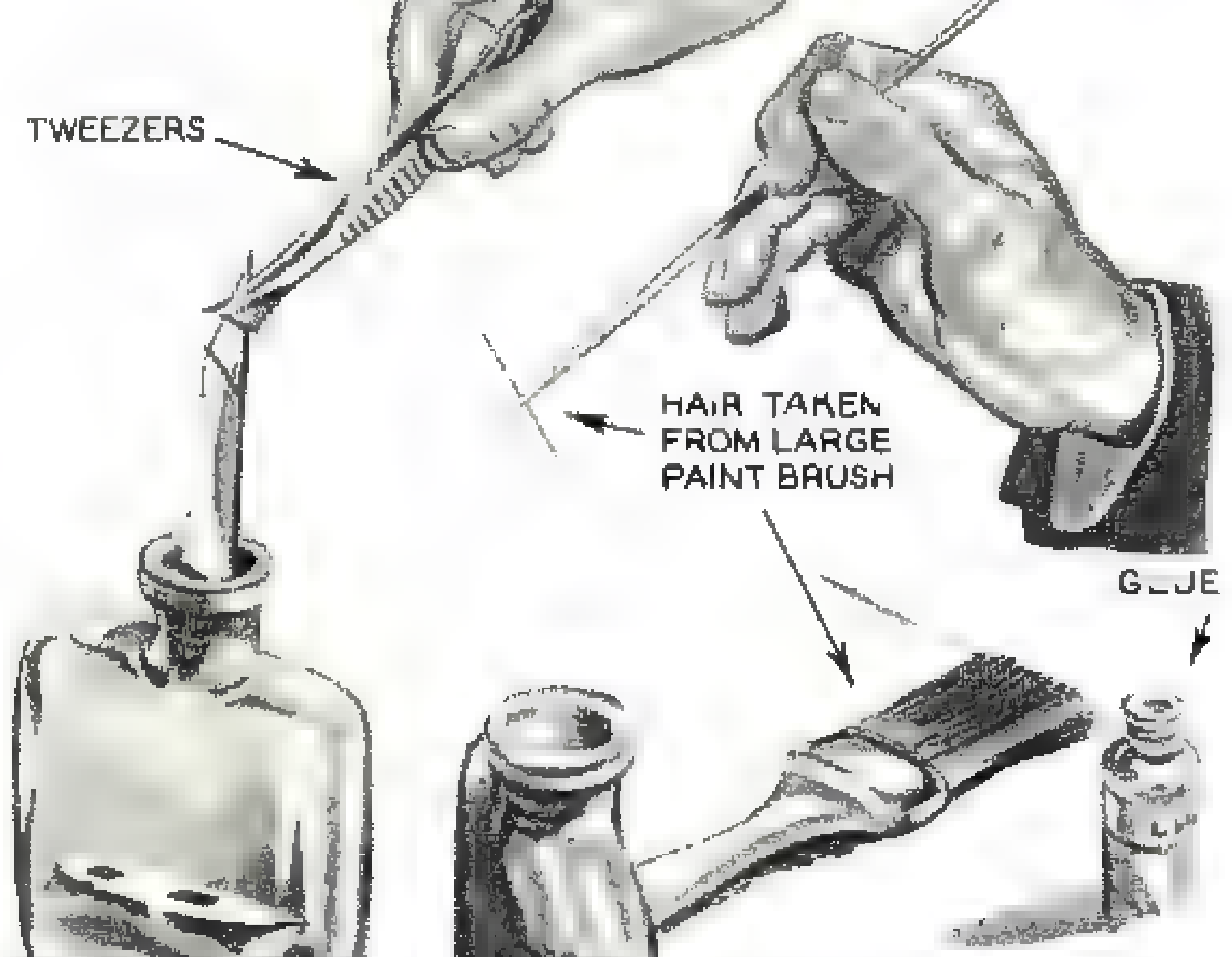

LOWER SAIL (ACTUAL SIZE), OTHERS IN PROPORTION
BEND AND GLUE TIPS TO YARD BELOW
WHITE PAPER
SPACE YARDS TO PERMIT BELLYING
YARDS
GLUE TO DECK
FORE MAST
SAILS AND YARDS GLUED TO MAST
SAILS BELLIED OUT AND GLUED

FIG. 2 - SQUARE RIG DETAILS

Tweezers are used to hold the mast and sails as they are inserted into the bottle.


TWEEZERS
HAIR TAKEN FROM LARGE PAINT BRUSH
GLUE

Hairs cut from a paint brush serve as sail stays, as shown in sketch above.

Make Diatom Slides For Your Microscope

by Julian D. Corrington, Ph.D.

BY FAR the most popular subject for study under the microscope is that great group of minute, one-celled plants, the *diatoms*. A glance at the illustrations will show some of the reasons for this favoritism; the remarkable variety and large number of types—the beautiful symmetry of form and intricacy of design—and the small size which requires magnification in order that these features may be seen.

Many readers doubtless have seen diatom slides, though few know all of the kinds that are made. There is the species strew or spread slide, in which many examples of a single species are scattered at random all over the field of view; the locality strew, where numbers of different forms from the same geographic district are similarly displayed; circle slides, with different diatoms spaced out evenly in circular arrangement; exhibition slides, the selected types accurately positioned, one at a time, to make up ingenious patterns; the type slide, consisting of one or more rows of different species, accompanied by a key list giving names and localities; and finally the test slide, where mounts of certain preferred species are used in testing microscope lenses.

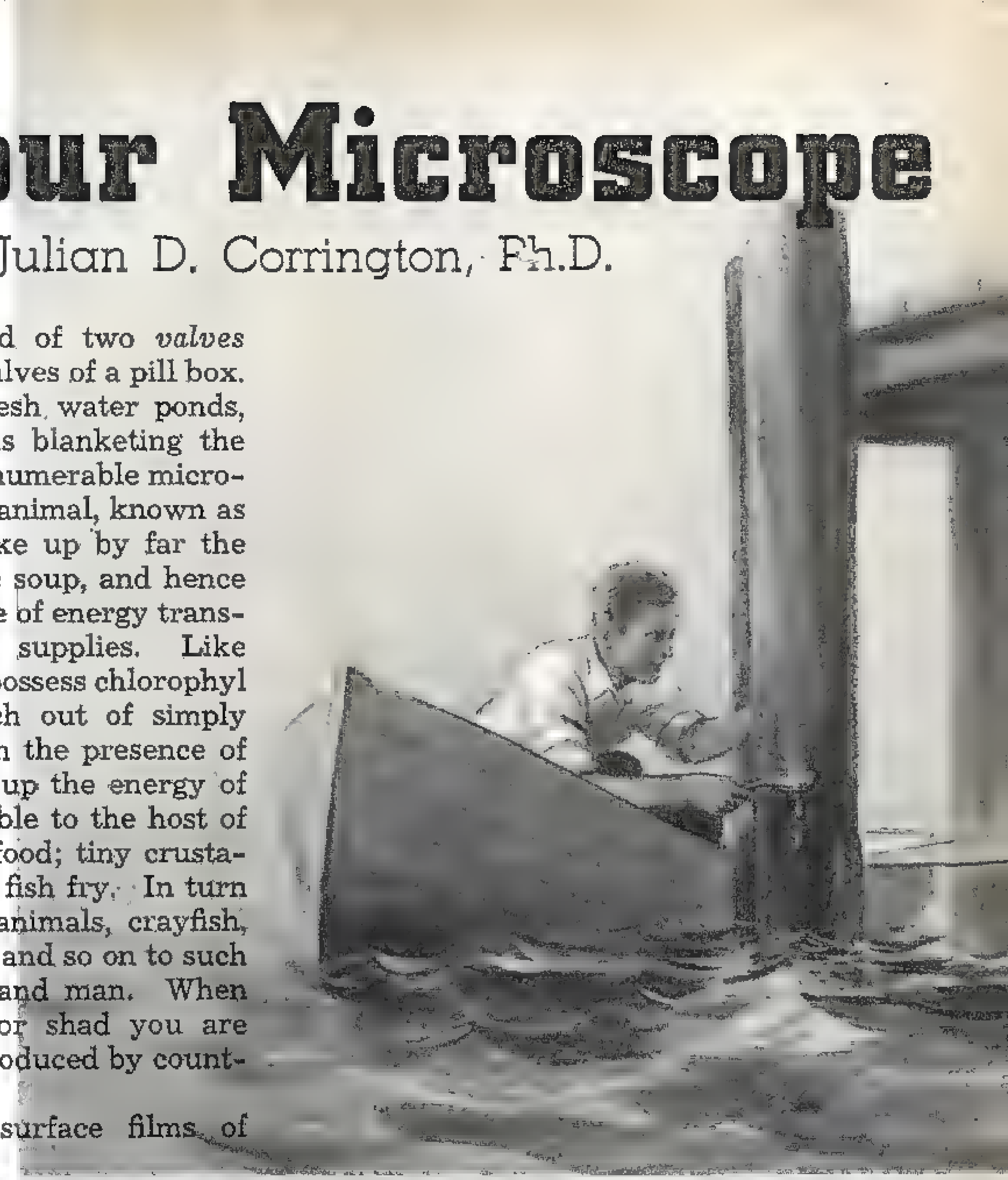
As a group, the diatoms make up one order of the class of plants known as green algae, larger and more familiar examples of which include pond scums and seaweeds. They occur all over the earth wherever there is water, salt or fresh, and their skeletal remains make up strata of rock as evidence of their abundance in past ages. One celebrated deposit of this material, known as diatomaceous earth or kieselguhr, is found at Richmond, Virginia, and there are many others. Since these formations may exceed three hundred feet in thickness, cover an extensive territory, and contain upwards of forty million diatom shells per cubic inch of earth, one would need some astronomical computing devices even to estimate the number of fossil diatoms in a given area.

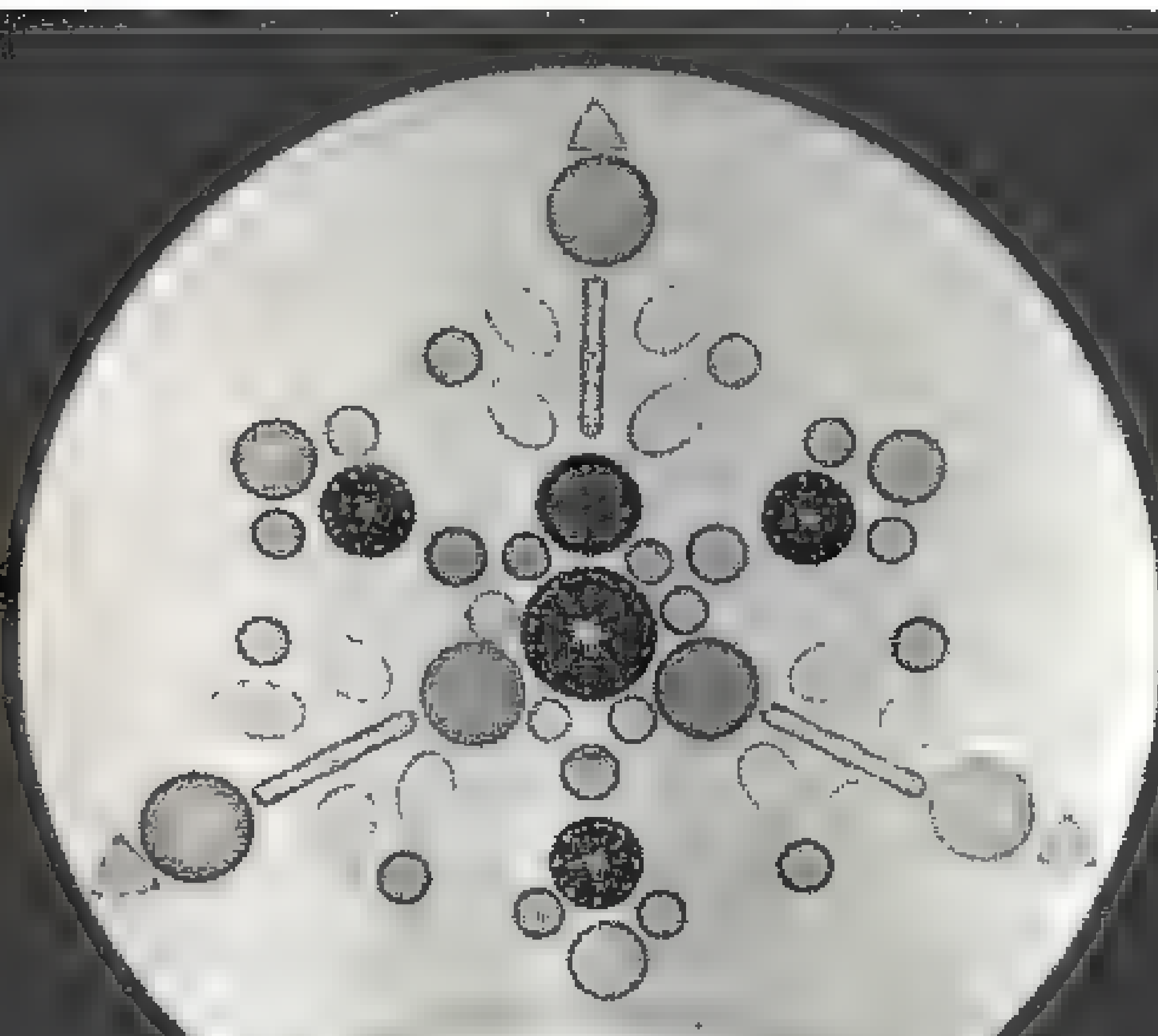
Ordinarily such minute plants would stand no chance of preservation in the rocks, but diatoms are encased in tiny glass boxes (silica) and it is these siliceous shells that remain behind after disintegration of the gelatinous protoplasm. Each shell is termed a *frustule* and is composed of two *valves* which fit together like the halves of a pill box.

On the surface of our fresh water ponds, rivers and lakes, as well as blanketing the entire ocean, is a layer of innumerable microscopic organisms, plant and animal, known as the plankton. Diatoms make up by far the largest share of this organic soup, and hence play a major role in the cycle of energy transformations involving food supplies. Like other green plants, diatoms possess chlorophyl and can manufacture starch out of simply water and carbon dioxide in the presence of sunlight; hence they bottle up the energy of sunlight and make it available to the host of creatures using diatoms as food; tiny crustaceans, hydroids, worms and fish fry. In turn these are eaten by larger animals, crayfish, frogs, turtles, the larger fish and so on to such fish-eaters as otters, seals and man. When you are dining on perch or shad you are eating material originally produced by countless diatoms!

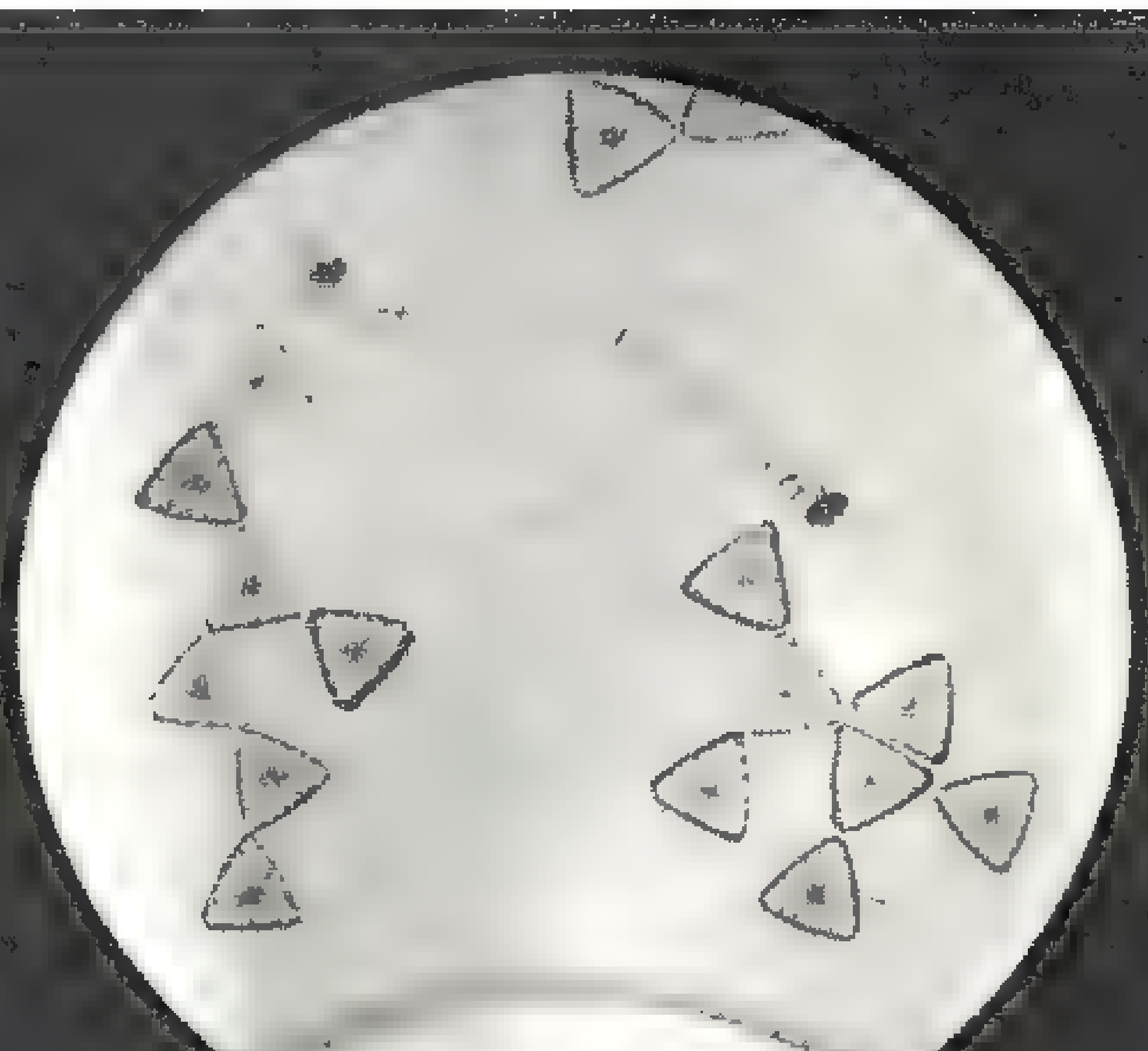
Not satisfied with the surface films of waters, diatoms occupy the bottoms as well, occurring as a fine, slimy brown sediment on muddy stream or ocean beds, and covering underwater pilings, stones,

[*Continued on page* 138]

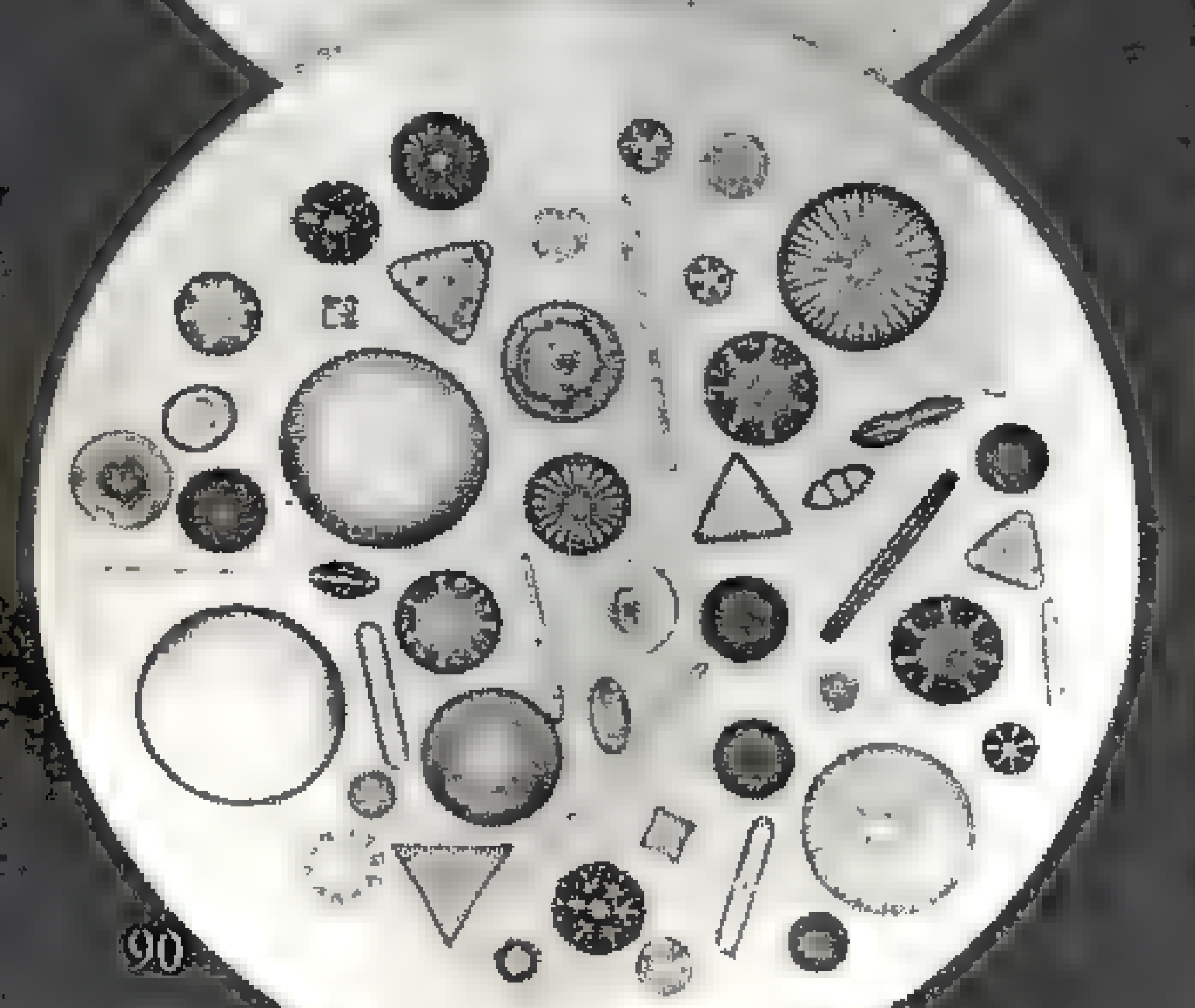




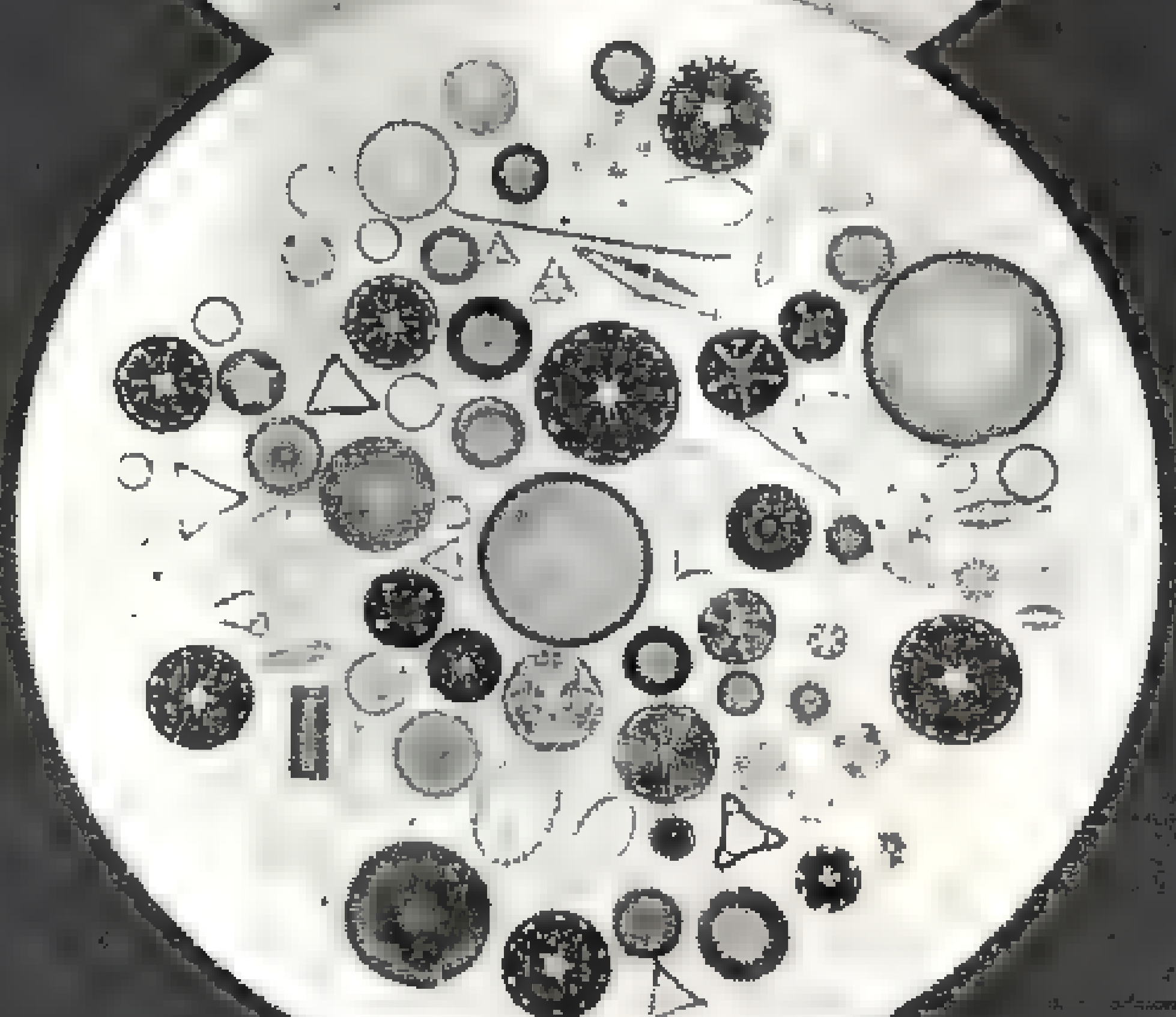
Left—A diatom exhibition slide involving 52 specimens. While simple for this type of slide, each specimen must be placed separately into accurate position.



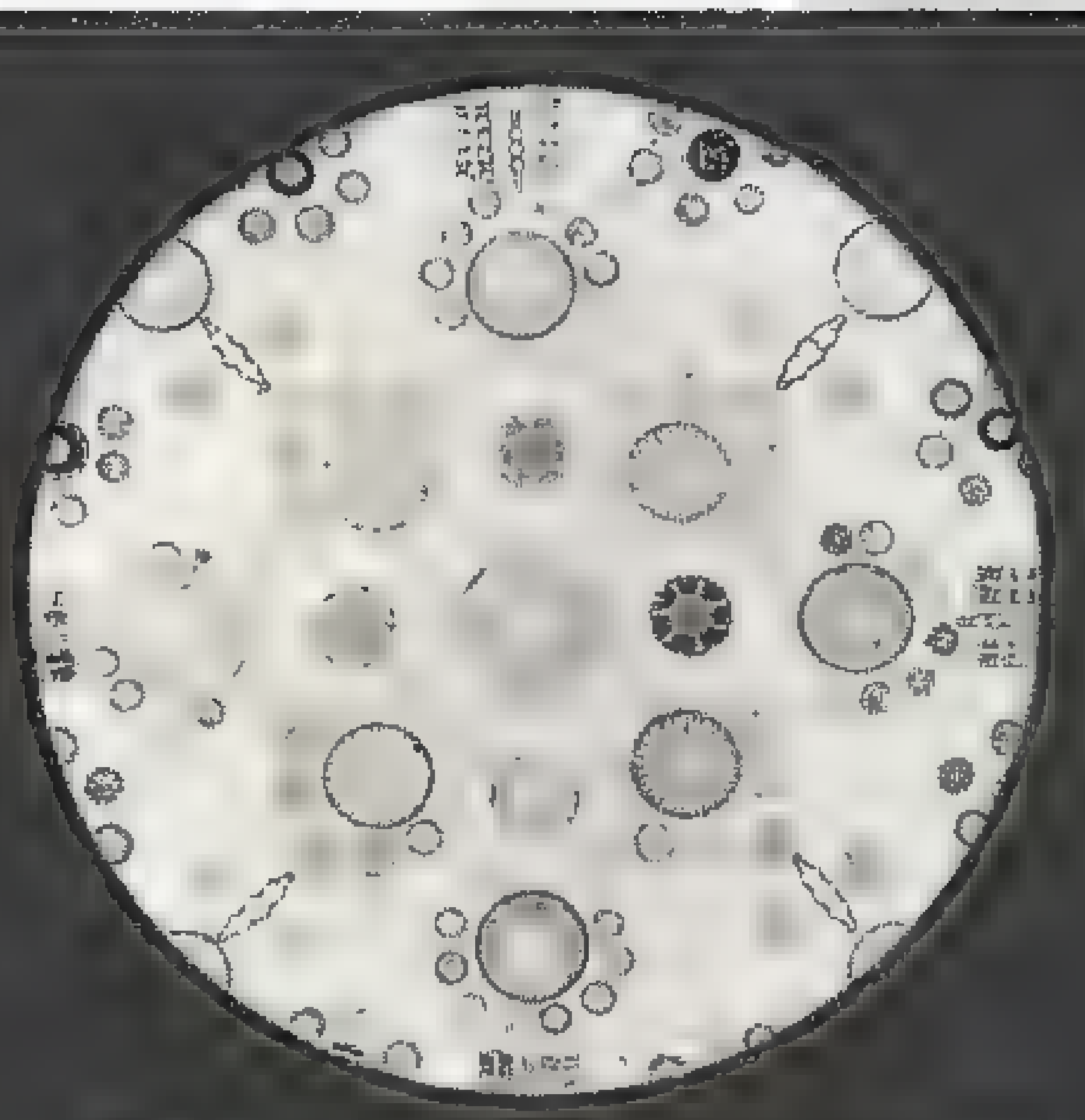
Right—A mount for the diatom Triceratium in which the living protoplasm and its central nucleus have been retained and stained.



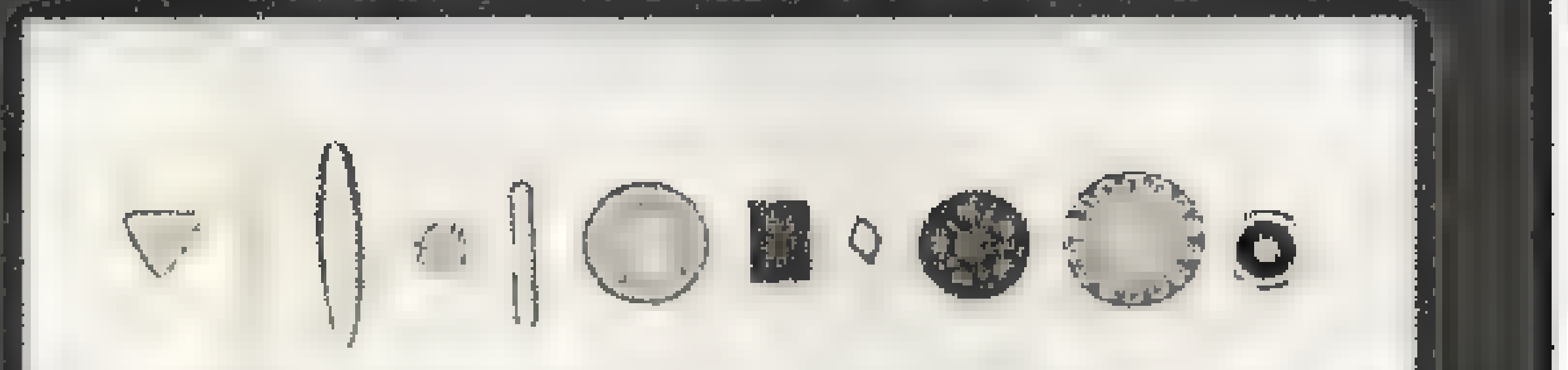
Left—Fifty-two diatoms arranged as a circle slide, an excellent method of showing wide variation in size and structure.



Right—Larger circle slides become more complex. This example includes one hundred specimens, mounted separately.

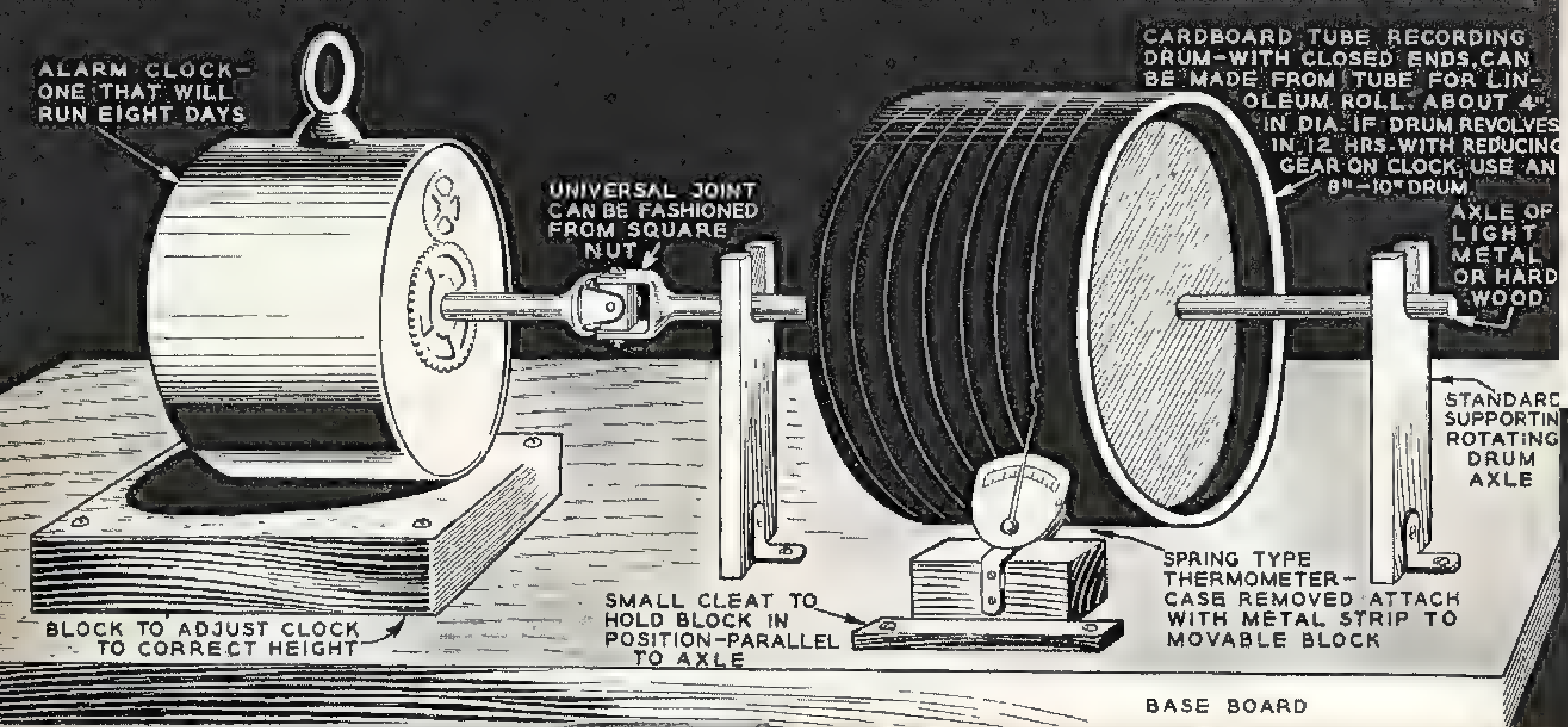


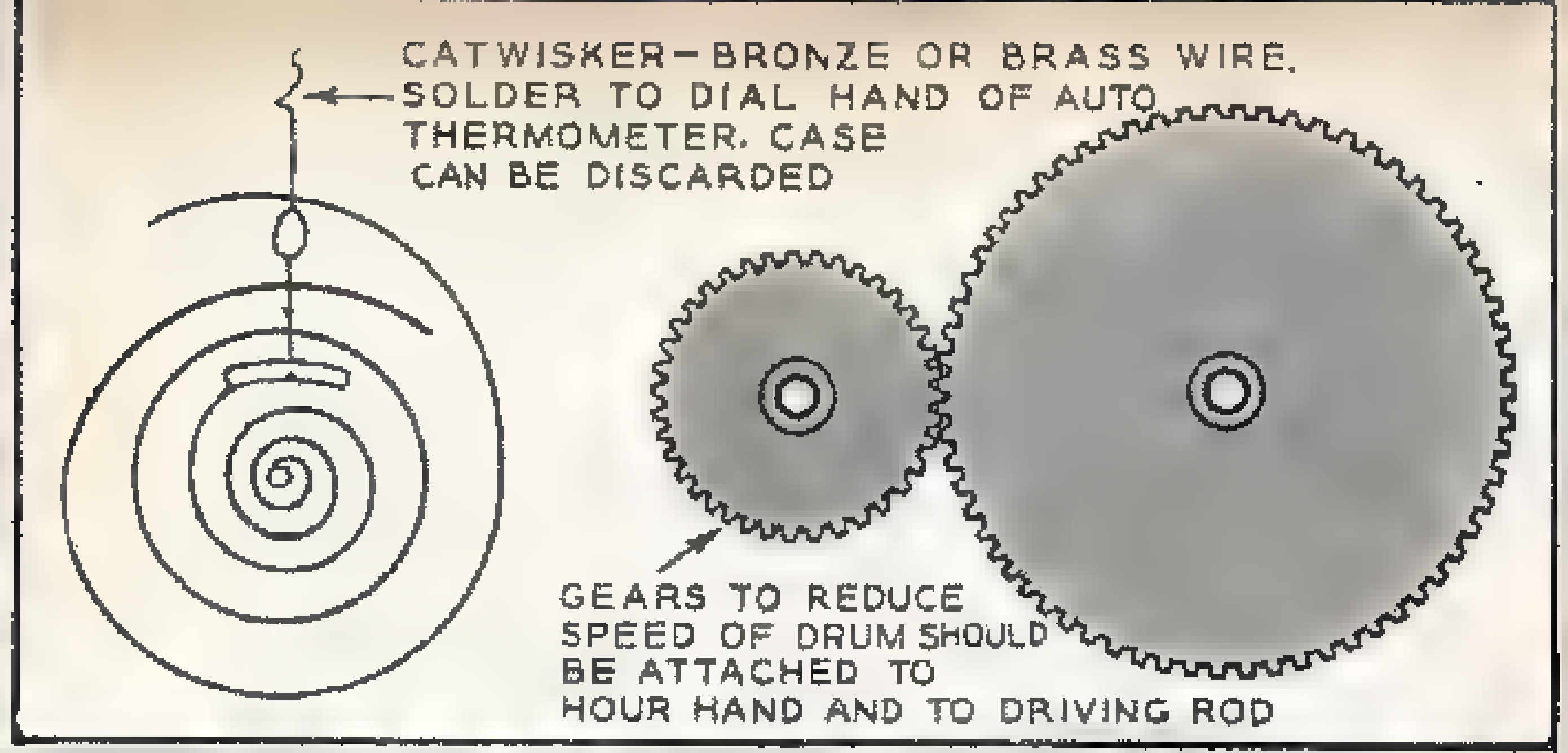
The central portion from a complicated diatom exhibition slide of 150 specimens.



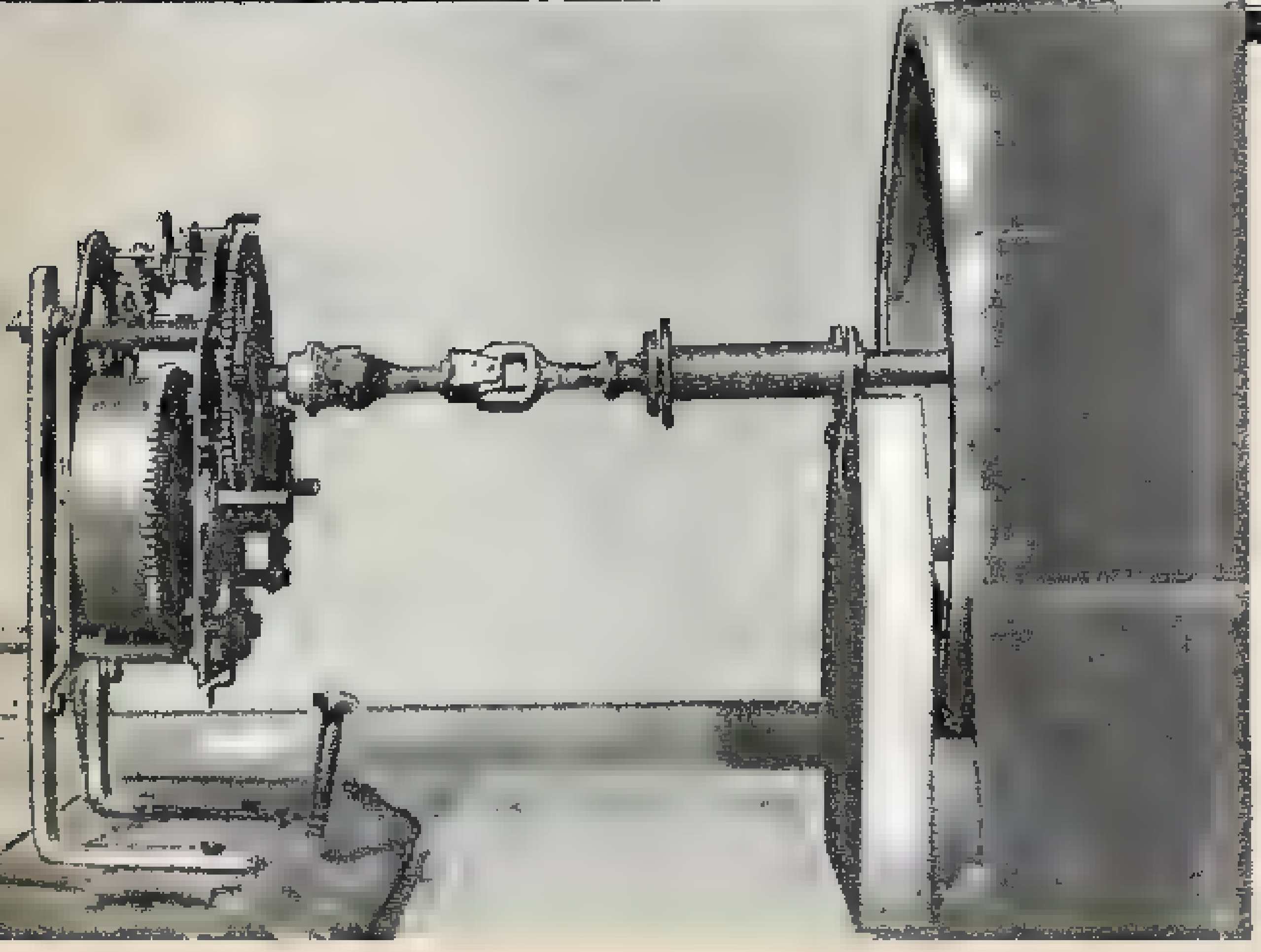
The diatoms shown (left to right) are: Triceratium favus, Synedra superba, Surirella robusta, Stephanopyxis grunowii, Pinnularia cardinalis, Coscinodiscus oculus-iridis, Climacosira mirifica, Biddulphia reticulata, Aulacodiscus archangelskianum, Actinoptychus splendens, Actinocyclus ralfsii.

Mounting diatoms for an exhibition slide. Operator holds bristle in right hand, bottle of cleaned diatoms in left. Chart is followed for pattern.


ALARM CLOCK—ONE THAT WILL RUN EIGHT DAYS
UNIVERSAL JOINT CAN BE FASHIONED FROM SQUARE NUT
CARDBOARD TUBE RECORDING DRUM—WITH CLOSED ENDS, CAN BE MADE FROM TUBE FOR LINOLEUM ROLL. ABOUT 4" IN DIA. IF DRUM REVOLVES IN 12 HRS. WITH REDUCING GEAR ON CLOCK, USE AN 8"—10" DRUM.
AXLE OF LIGHT METAL OR HARD WOOD
STANDARD SUPPORTING ROTATING DRUM AXLE
SPRING TYPE THERMOMETER—CASE REMOVED ATTACH WITH METAL STRIP TO MOVABLE BLOCK
SMALL CLEAT TO HOLD BLOCK IN POSITION—PARALLEL TO AXLE
BLOCK TO ADJUST CLOCK TO CORRECT HEIGHT
BASE BOARD


CATWISKER—BRONZE OR BRASS WIRE. SOLDER TO DIAL HAND OF AUTO THERMOMETER. CASE CAN BE DISCARDED
GEARS TO REDUCE SPEED OF DRUM SHOULD BE ATTACHED TO HOUR HAND AND TO DRIVING ROD

INEXPENSIVE THERMOGRAPH MADE FROM AUTO THERMOMETER



Top—The detailed drawing shows the method of hooking up the cylinder to the clock motor. Although a universal joint is used, the builder should attempt to line up the two shafts as correctly as possible. Above—The recording cylinder hooked up to the motor with its outside case removed.

by V. S. Gleason

HOW cold was it last night? Did the temperature in the garage drop so low the radiator was in danger?

Many hobbyists, especially if they are trying their hands at weather forecasting, have felt the need for a simple temperature recorder. Here is one that may be made easily and inexpensively, using a spring-type thermometer of the kind sold for a few cents at automobile accessory stores.

Remove the case and solder a piece of bronze or copper wire to the end of the indicating hand. This additional length will magnify the arm movement. Then attach the instrument to a block of wood by a metal strap. The recording drum may be made of cardboard tubing such as linoleum is wound upon. Usually this may be had for the asking at a furniture or hardware store. Mounted upon a light metal axle between two upright supports attached to the 2"x12" plank used as a base, it should revolve freely on its bearings. The driving mechanism is made from an old alarm clock, attached so that the hour hand is in line with the drum shaft. Connection is made through a universal joint to prevent friction due to misalignment.

Place the thermometer in such a position that the end of the catwhisker touches lightly upon the surface of the recording drum, and screw it fast. The recording sheet is prepared from ordinary letter paper by holding it over an oil lamp, minus chimney, until well blackened. After the record is made, it is preserved by dipping it in a solution of one part shellac to three parts alcohol, and hanging it up to dry. Thereafter it may be handled without danger of smudging.

Because the hour hand of the clock makes one complete revolution every twelve hours, the block to which the thermometer is attached must be slipped over to prevent overrunning the tracing on the drum. A small cleat as shown in the diagram serves as a guide to save time when making this change. An improved method is to introduce a reducing gear so as to turn this drum over only once in 24 hours.

To calibrate the instrument, set the thermometer hand at various points on the dial—say, ten degrees apart—and turn the drum to produce a series of scratches corresponding to the desired readings. These spacings may then be laid out on the edge of a card to form a ruler-like instrument, with its graduations in degrees instead of fractions of an inch. Or, a series of parallel lines spaced by the proper amounts may be laid over the record for quick reading.

Above — The recording thermometer in operation. The lines scratched on the cylinder are visible on the right side.

Left — Attaching the small bronze or brass wire to the end of the dial pointer of the automobile thermometer. In use, a case on the thermometer is not necessary.

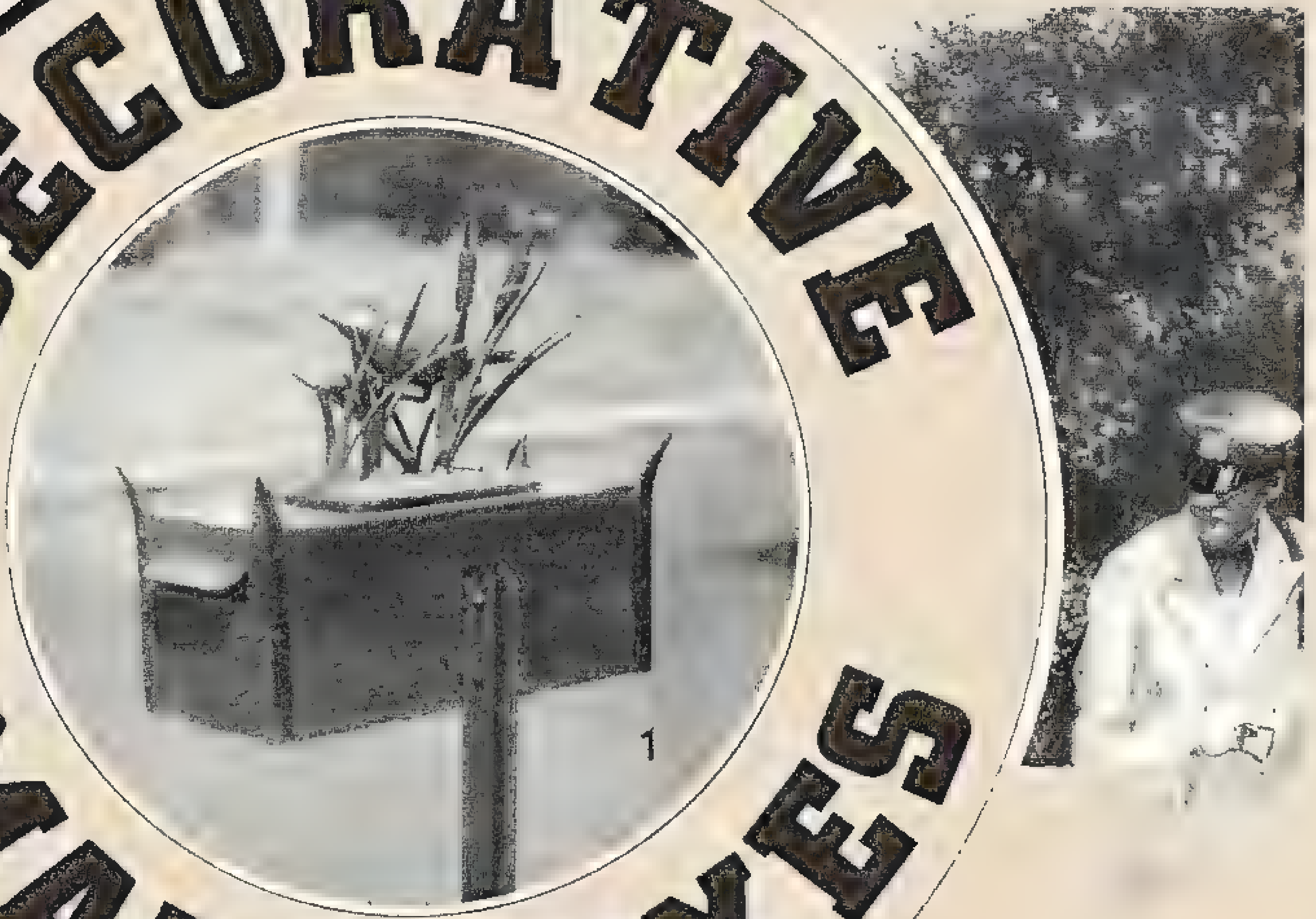
Right—Washing the completed record of the thermograph in a solution of alcohol and shellac to give it permanent protection against damage.

It is advisable each time you start the recorder to scratch the initial temperature reading upon the record itself so as to prevent errors in interpretation.

When setting up the equipment for use, it should be placed in a reasonably protected spot so that wind will not affect the reading on the thermometer. If it is to be used outside for long periods of time, it should be covered with a hood which could consist of a wooden box, to protect the instruments against dust and rain. Be sure to leave plenty of openings in the box to permit sudden temperature changes to be transmitted to the instrument quickly without a noticeable time lag.

Three "OO" Gauge Model RR Cars is the title of a how-to-build article in the November issue of MECHANIX ILLUSTRATED which will have more than ordinary appeal to model fans. Each car is a gem, and the building directions are so simple that any modeler will have no trouble duplicating them. Don't miss the November issue.

DECORATIVE MAIL BOXES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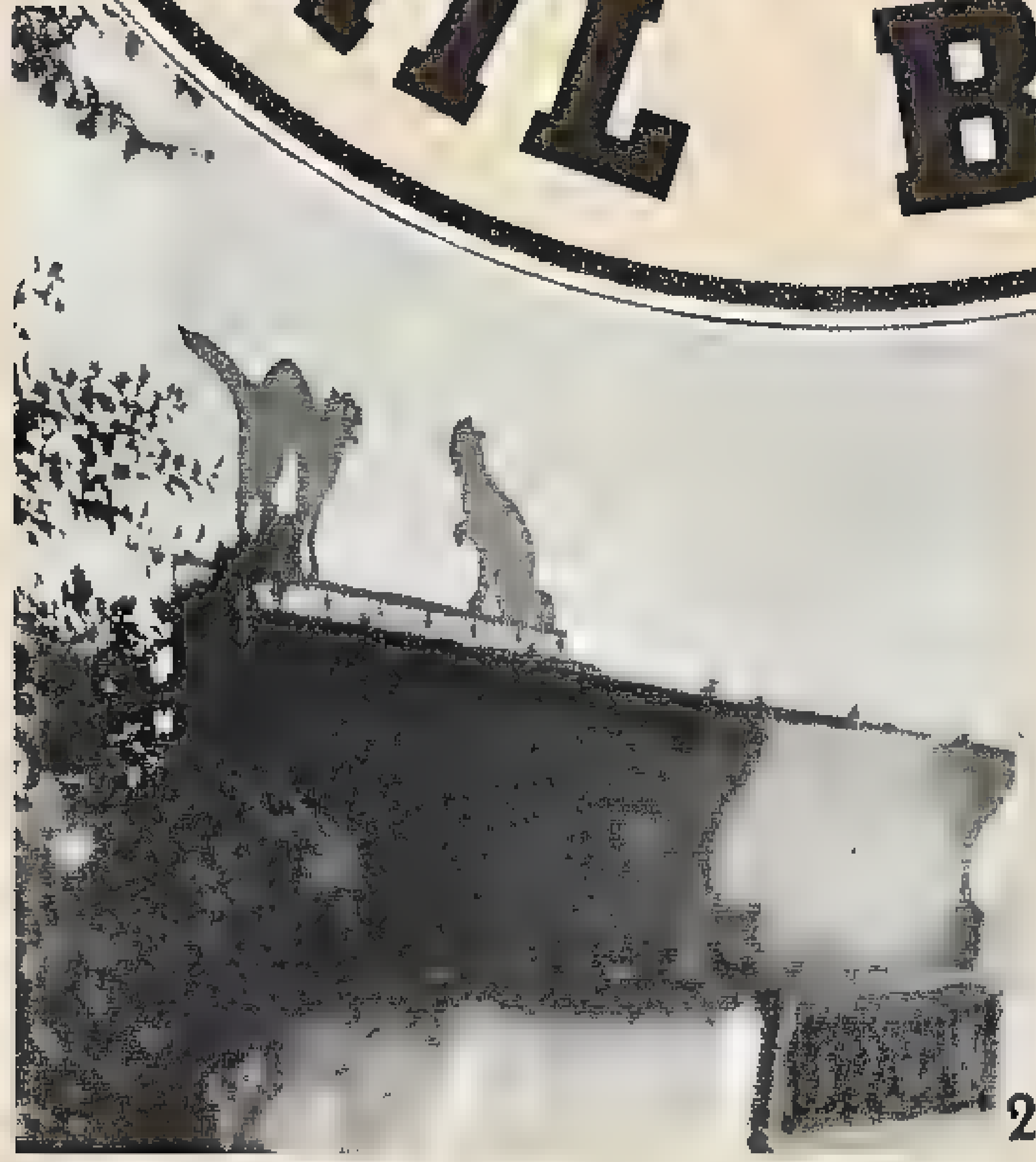
by

Dale R. Van Horn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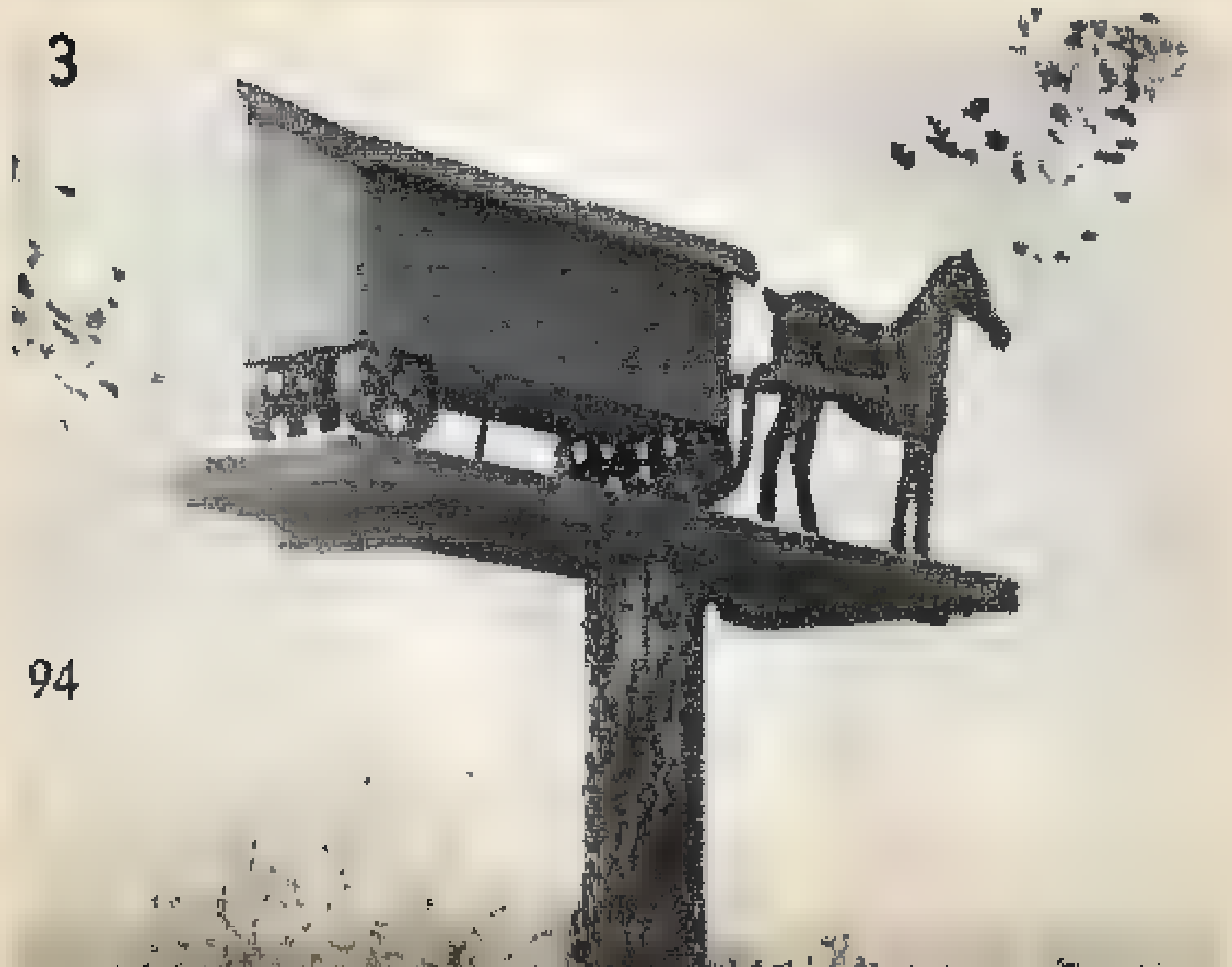
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A RECENT drive through a mid-western city's most exclusive residential district disclosed but one appropriate mail box. All others were the large galvanized iron affairs commonly used in mail order districts.

"How odd," someone exclaimed, "that more of these expensive homes aren't provided with attractive mail receptacles. These good folks spend $25,000 or $50,000 for a home, landscape it well, then put a $1.98 mail box on a 30-cent fence post right out front."

Although a mail box first of all should be weather proof and lasting, it would seem that a little more attention to its appearance would be worthwhile.

As for the cost, look at the mail box in Figure 2. This is of solid brass and bolted together. There are two angry cats in the cutout at the back which required some work with jig saw and file.

In Figure 4 is shown a sheet iron box, hand made and spacious, mounted on two angle iron posts which are embedded in the ground. The chief element of novelty about this box is the parrots which adorn the back. They are also cut out of the sheet metal. Appropriately enough, the owner's name is Polly, so a pair of pollys becomes the mail box motif. Ideas like this are always appropriate for mail box designs when and if they can be worked in harmoniously.

A neat little job, easy to make and durable, is the mail box shown in figure 5. Here is a stout box of oak and trimmed in sheet iron. The front plate has been cut out in a decorative design, then fastened to the front of the box with screws.

The mail box shown in figure 3 is an ideal story-telling mail box, yet entirely homemade. To begin with, the box is the side opening, galvanized iron kind still quite common. The iron wheels, picked up at an auction or the junk yard, were securely fastened to the bottom. The horse is a sheet iron cutout and the harness and shafts are light strap iron.

Another metal cutout design of good proportions is the silhouette back of the metal mail box shown in figure 6. The sides of the box are of sheet iron, riveted and welded together and is mounted on a pair of iron posts 1½ inches square.

Another metal box of plain lines but topped with a decorative unit of blackbirds and cat tails in iron is shown in figure 1. Note the simple support—just an angle iron riveted to the rear of the box. The corner angle irons which are riveted to the sides and ends of the box to hold these flat pieces together are continued to points and bent slightly outward, furthering the artistic appearance of the box.

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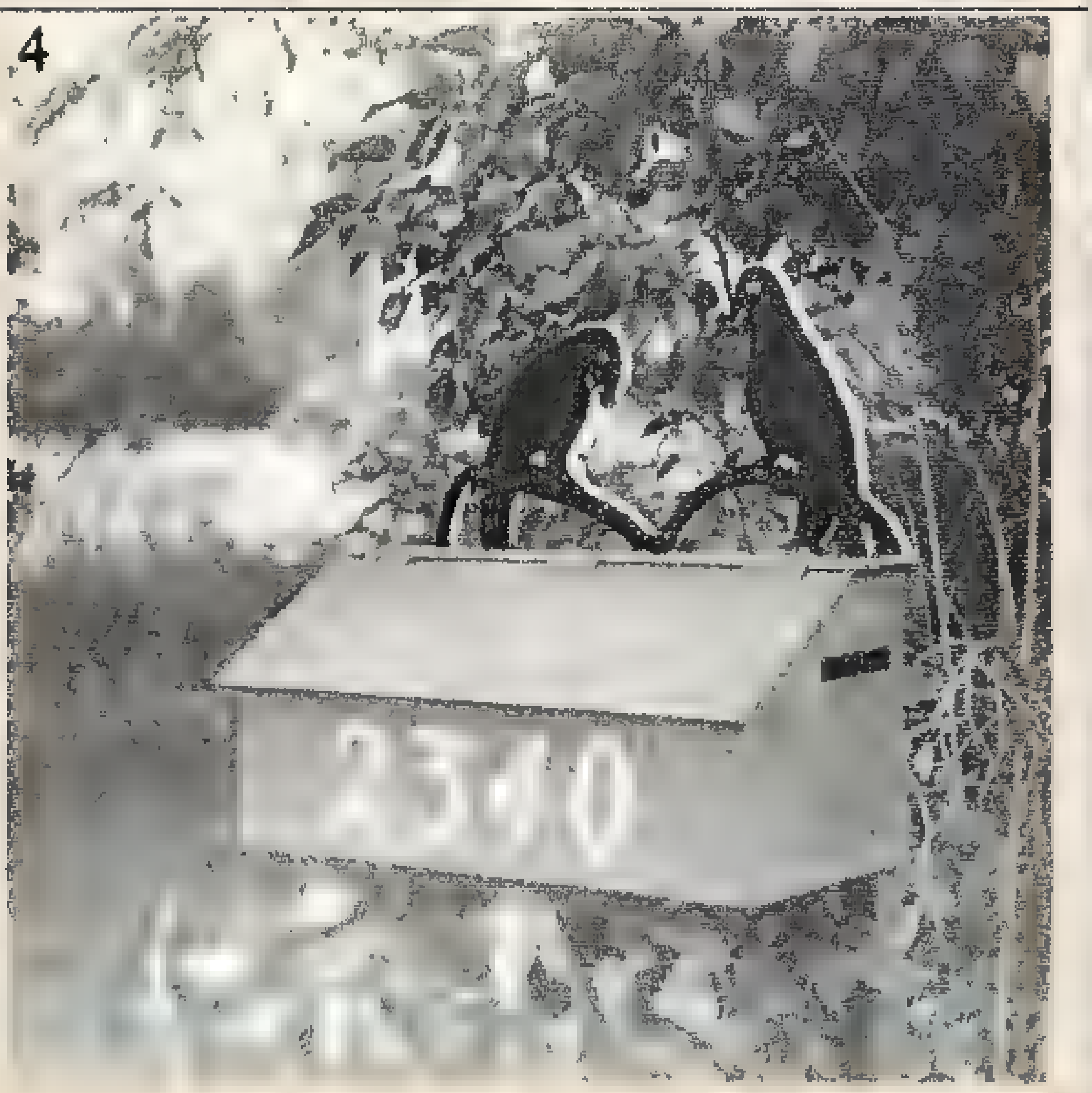

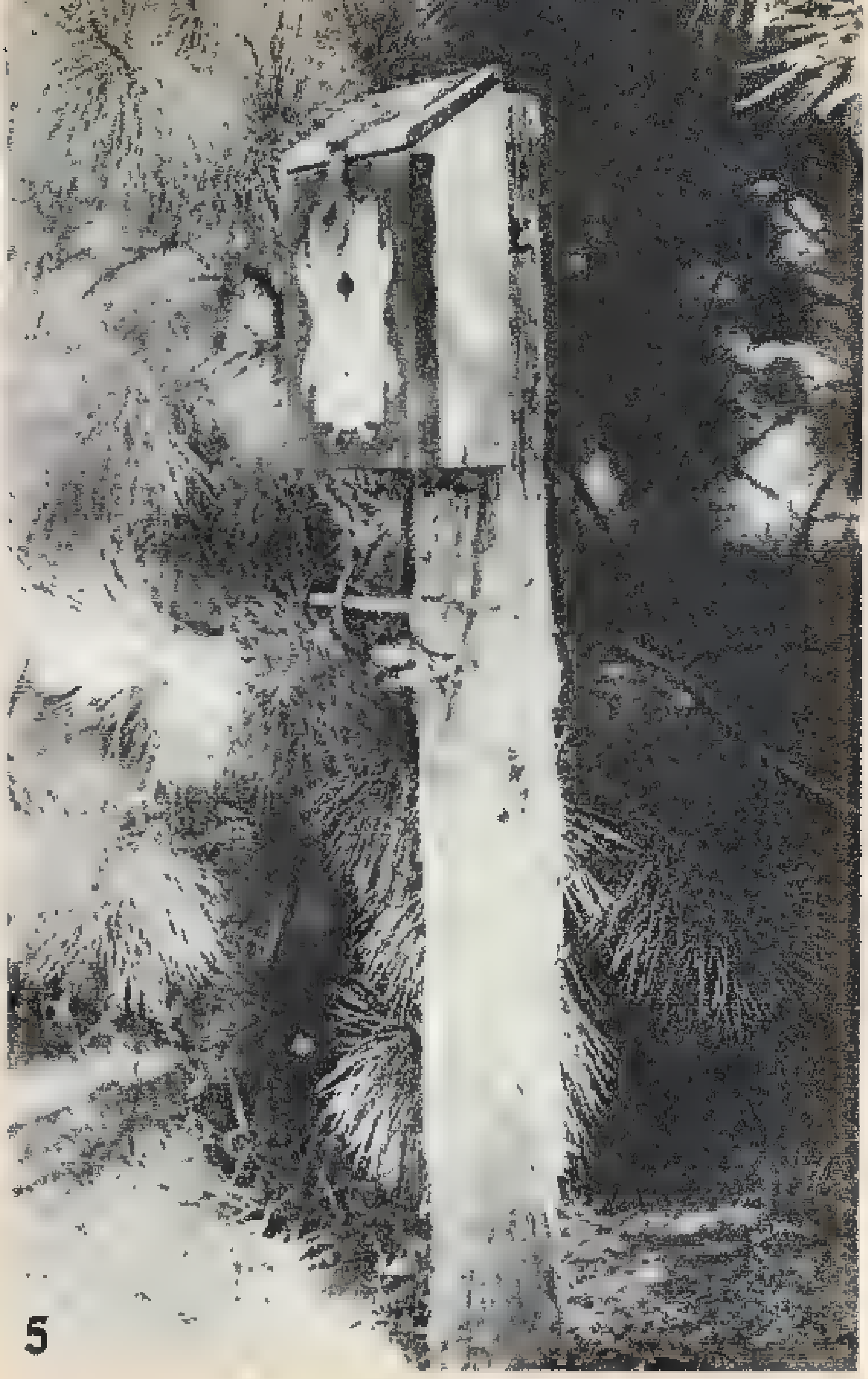
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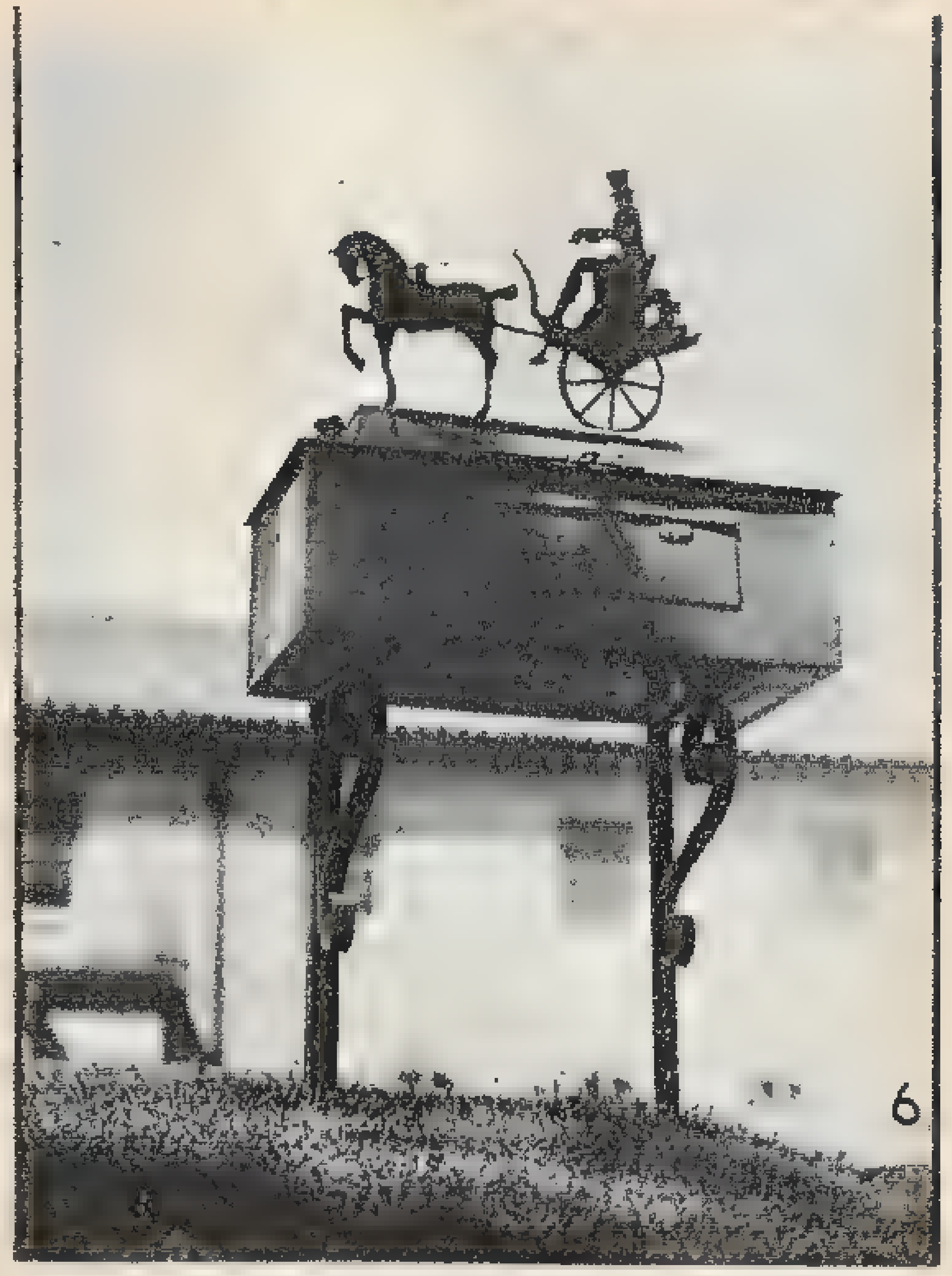
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Those who are tired of the conventional type mail box can, with a little effort and planning, use their own ideas to good advantage in the construction of a mail box having a motif in keeping with individual conditions. When completed the project will be a continual source of pride to the owner, as well as being a most useful ornament for the old or new house.

Hints FOR THE HOME ELECTRICIAN

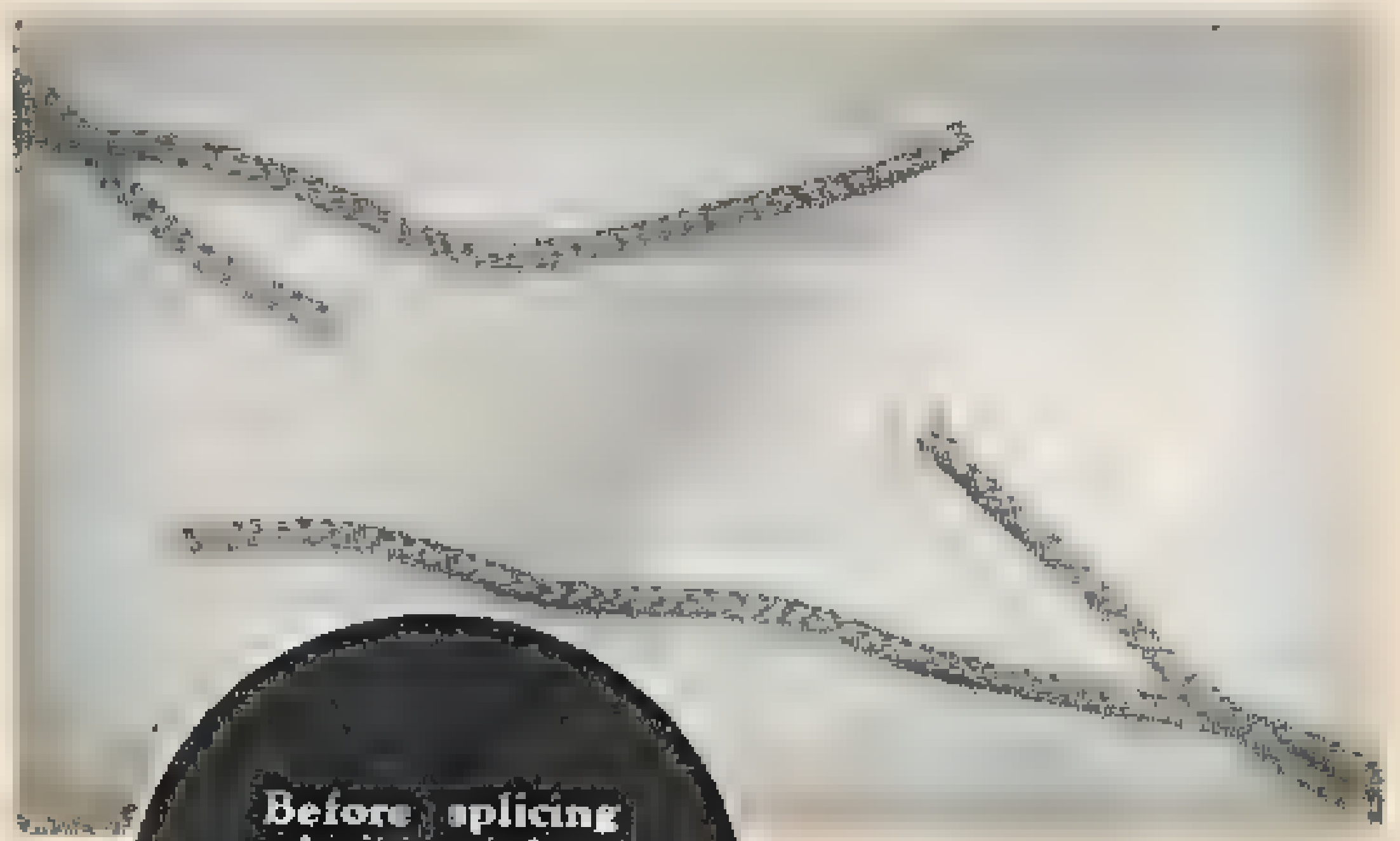
A few inexpensive tools make many home electrical repair problems easy for either husband or wife.

by
Harry Hirsch

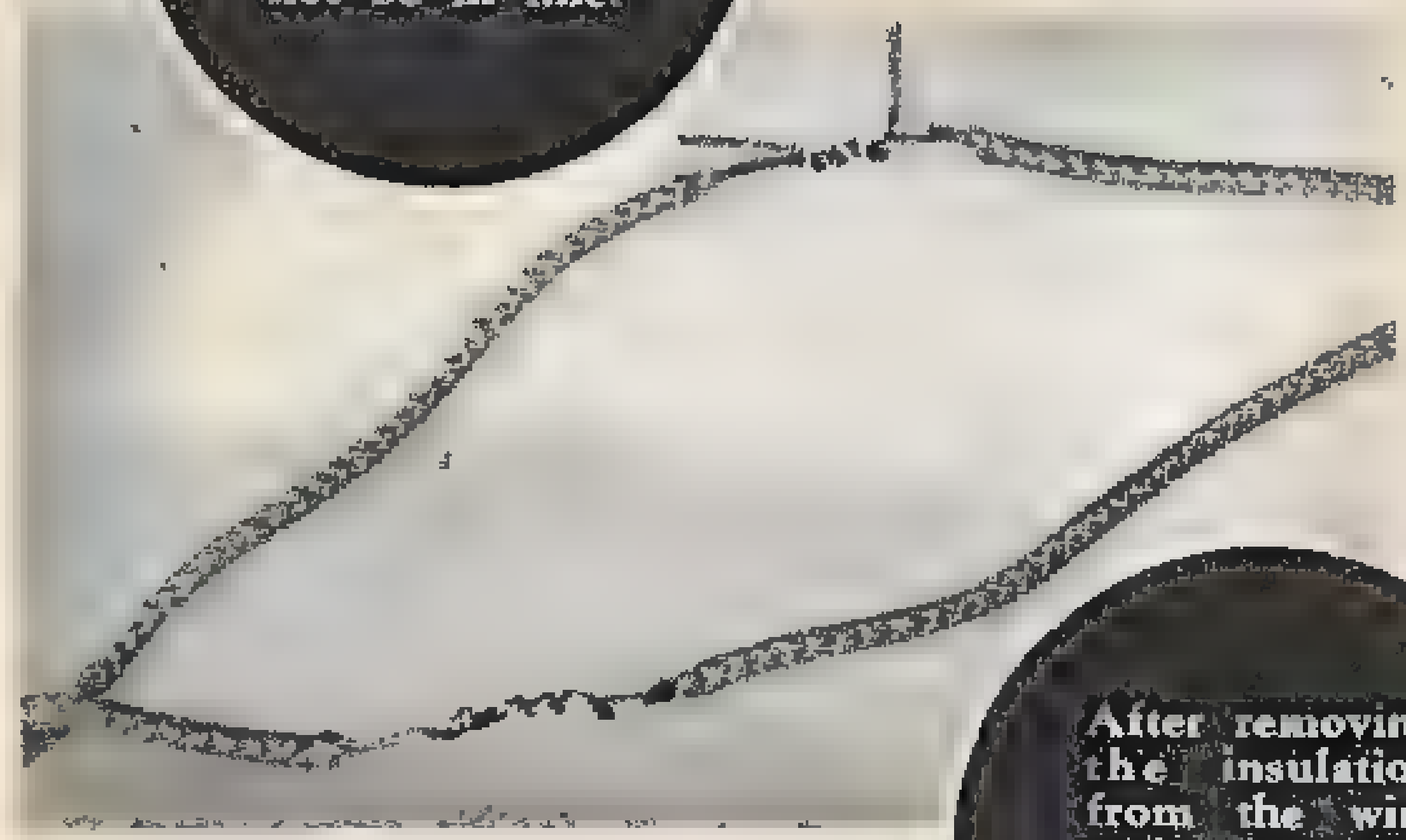
THE ordinary electrical repairs that must be made around the house from time to time usually are of very simple nature. The required tools themselves are simple and if they are not already available they can be purchased inexpensively at the neighborhood hardware store. A representative assortment that even the lady of the house can learn to use competently with a little instruction is as follows: a small electric soldering iron, ordinary pen knife (the "boy scout" variety will stand a lot of abuse and is therefore recommended), six-inch "electrician's" side cutting pliers, a small screwdriver, a roll of rosin core solder, and a roll of black friction tape.

Probably the most common electrical job the handy man is called on to do is extending the cord of a floor lamp, a radio receiver, a fan, etc. The first step is to cut the ends of the old and the new cords unevenly, as shown in the pictures, using the side-cutting pliers. Hold the end of the wire and carefully pare off about two inches of the cotton and rubber covering with the knife. At first you will probably nick off a few strands of the wire, but after a little practice the insulation can be removed with two or three short strokes. Scrape the wire bright and clean with the back edge of the knife, twist up the loose strands, and scrape it again.

Twist together the staggered ends of wire, using tight but somewhat open twists. Plug in the electric soldering iron, and while it is heating scrub its points with a coarse piece of emery cloth. After about five minutes hold end of wire solder to the points, and the latter will instantly become coated with a bright layer. This operation is known as "tinning." Now hold the hot iron and the solder against the twisted wire joint, let the molten solder run all around it, and remove the iron after about ten seconds. Let the joint cool and it will be fastened securely. Soldering is a very simple process and is always easy if the wire is clean and the iron is well tinned.



Before splicing wires cut them to unequal lengths so that the joints will not be in line.



After removing the insulation from the wire ends, carefully clean the wire where they are to be joined.

To complete the job, tear off about five inches of friction tape and wrap it tightly around the joint, overlapping the insulation at each end. Incidentally, ordinary white adhesive tape (the kind you buy in the drugstore) is also very good for this purpose, especially if the joint will show up in the living room or some other place where black might be objectionable.

To connect the loose end of the new wire to the attachment plug, pull the wire through the center hole first, pare off not more than ½″ of the insulation and make sure no loose ends stick out. Pull the wire down carefully and bind the ends under the connecting screws. Short circuits frequently occur in these plugs because loose strands of the fine wire stick out and touch each other. If you want to do a really nice job, cut some short, narrow pieces of friction tape and bind it around the frayed insulation at the ends of the wires.

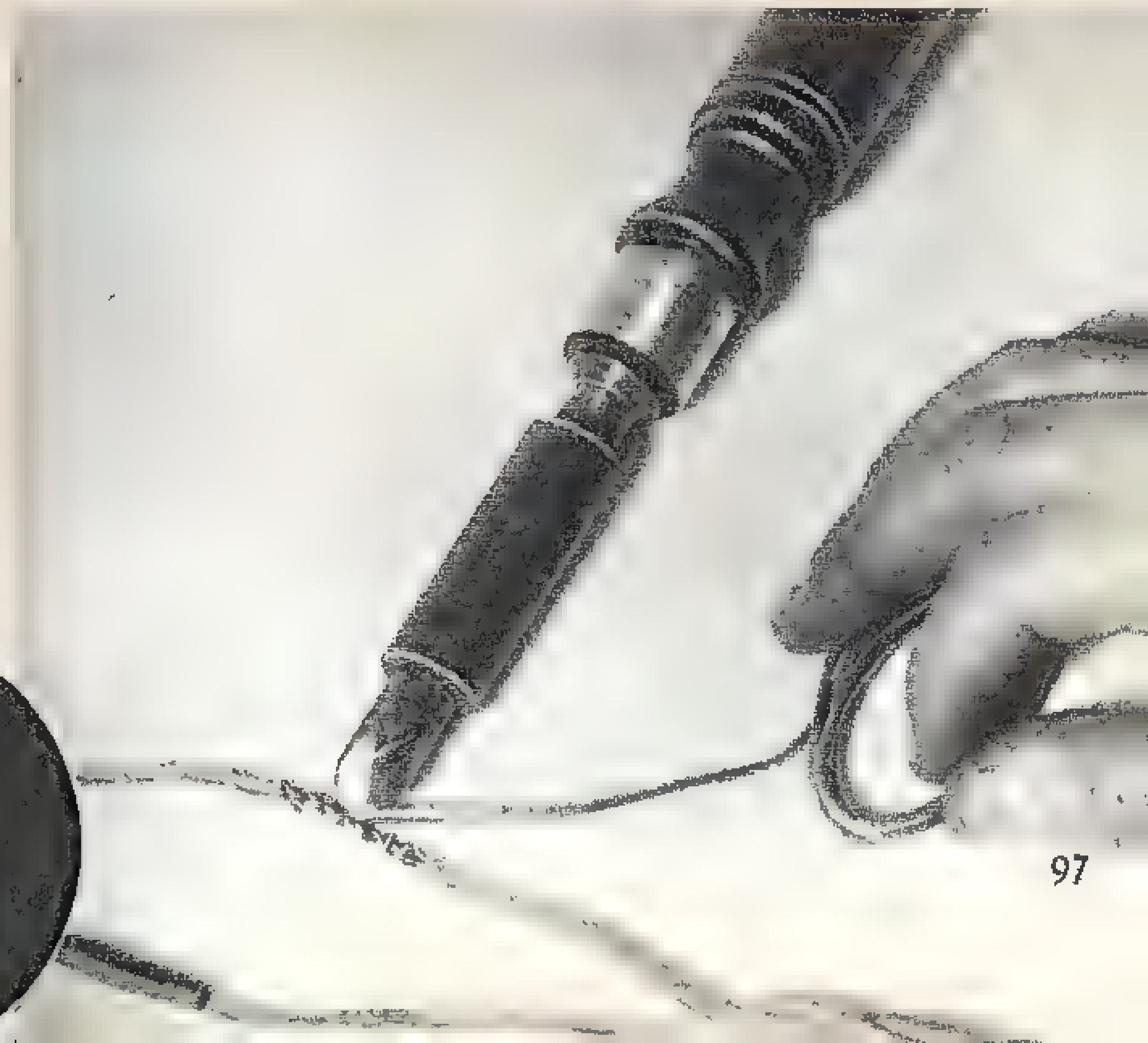
The plug shown is a common type. There are better styles with short handles on them to facilitate removal from tight receptacles.

"Exactly what is a 'short circuit'?" many people ask. A "short" is an accidental connection that causes a sudden and heavy rush of current in excess of the safe carrying capacity of the electric wiring, and usually causes the protective fuses to burn out. If there were no fuses in the circuit, the wiring itself would become white hot, and might readily start a fire. Two worn wires from a floor lamp, for instance, might eventually lose their outer covering because they have been stepped on. When they touch each other there is a flash of flame, and an instant later the fuses blow, causing all the other lights on the circuit to go out.

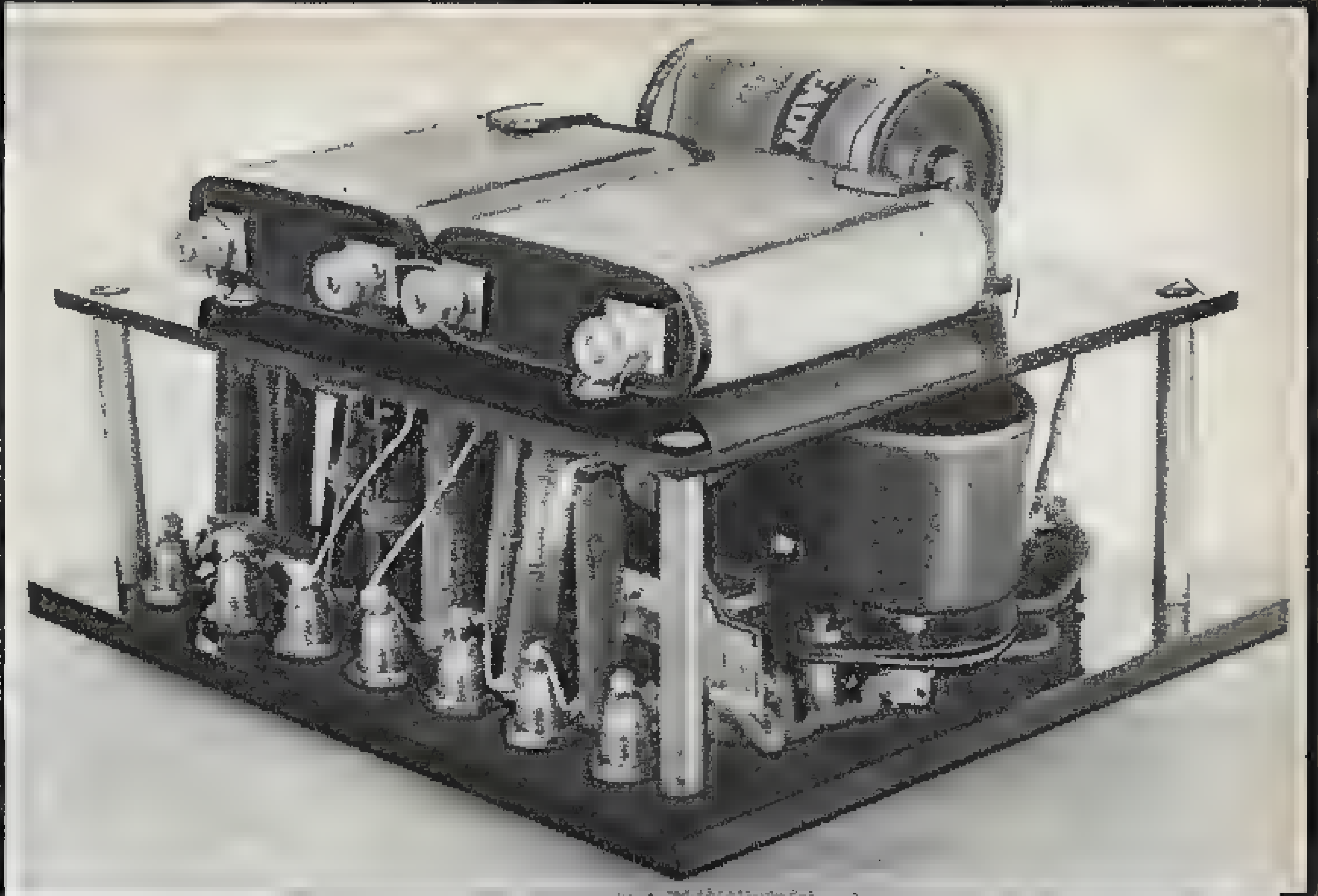
Sometimes the house fuses blow out with all electrical devices in good working order. This usually is caused by an accumulation of normal "loads," all coming on at once. For instance, a refrigerator, an oil burner, a toaster and a heating pad may by chance all snap on at about the same time. The starting currents of these machines and instruments are rather high, and the correct normal size of fuse may blow. Unless the blowing becomes regular, do not install a larger fuse; it is safer to retain the normal size and to put in replacements.

Incidentally, not many persons know about several little conveniences in the fuse field. The first is a fused three-way outlet. This contains two automobile type cartridge fuses inside the molded form; they are quickly removed with a nail or other thin object. If there is a short circuit or temporary overload on the appliances connected to that outlet, only the fuses contained in it blow out, and the rest of the circuit is not affected. This is a great convenience, especially if the house fuses are in some dark spot in the cellar or up against the ceiling in a closet in an apartment. Equipping every regular outlet in the house with one of these outlets (cost only about a quarter) is an excellent investment.

The same idea is carried out in a fused

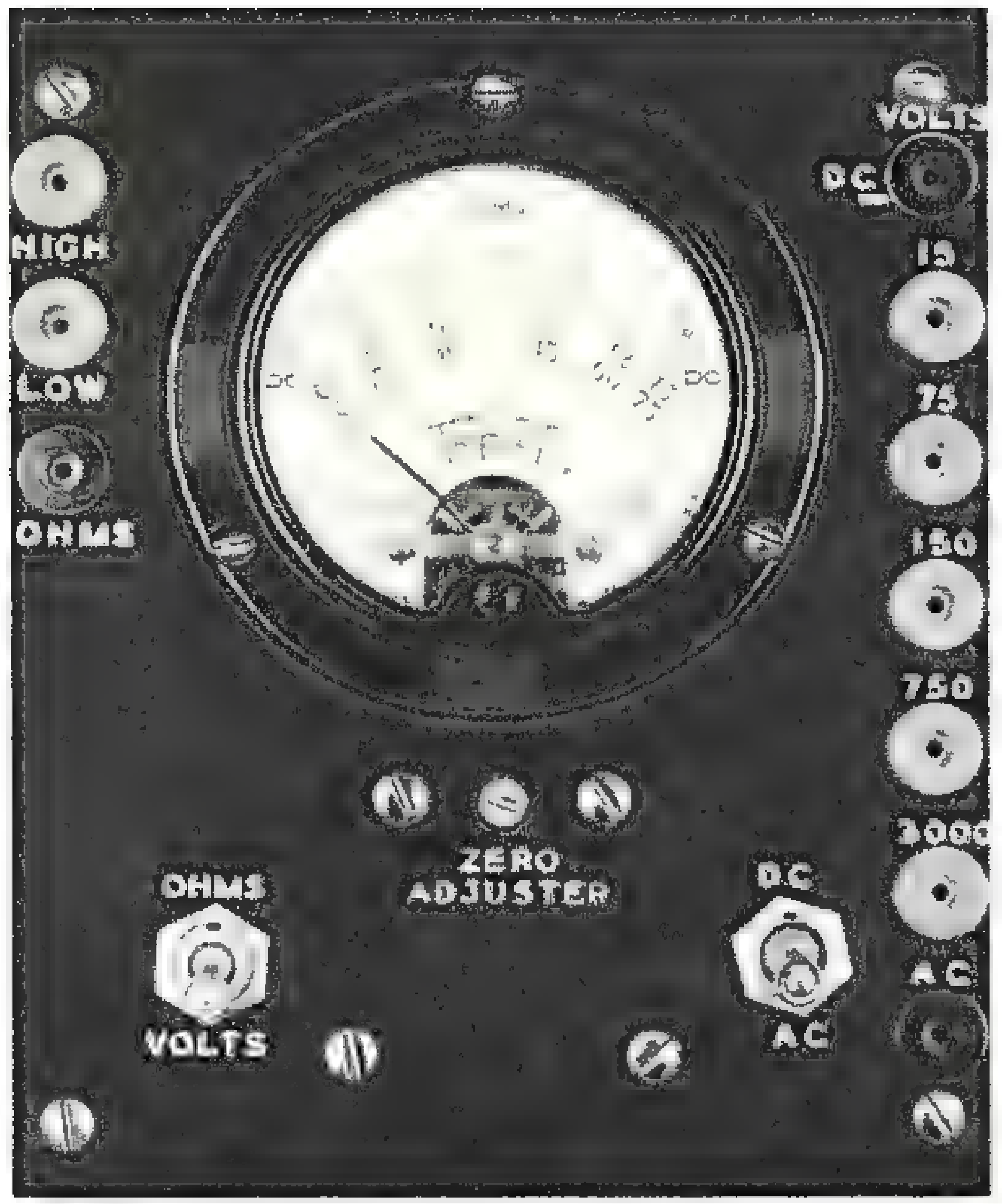


A well tinned soldering iron will be found to be a great convenience for making a satisfactory joint.



Build the M I TESTMASTER

by John H. Potts



A GOOD multimeter is undeniably the most useful of all test instruments for anyone who works with electrical apparatus. Yet the high cost of the more elaborate commercial instruments has prevented many from purchasing such a device. Though the Mechanix Illustrated "Testmaster" to be described is inexpensive and simple to build, it has been carefully engineered to give the utmost in ease and accuracy of operation and a wider range of application than many of the more expensive factory-built instruments now on the market. It is compact—scarcely more than a handful—yet it combines in a single unit the advantages of twelve individual instruments of equally high grade. And the total cost for all components is well under fifteen dollars. It won't become obsolete; a volt is always a volt, likewise ohms remain ohms as the years roll by. This instrument measures both volts and ohms over an unusually wide range and with ordinary care should last a lifetime.

Not only will the radio and electrical experimenter find countless uses for the "Testmaster," but every person faced with any electrical problems will find it invaluable. Anyone troubled with too frequent light bulb burnouts may find the clue to the cause by testing the line voltage. The Testmaster's varied voltage scales—for both a.c. and d.c.—may show that the voltage is too high. The ohmmeter scale will settle problems in which a piece of electrical equipment is suspected of being burned out.

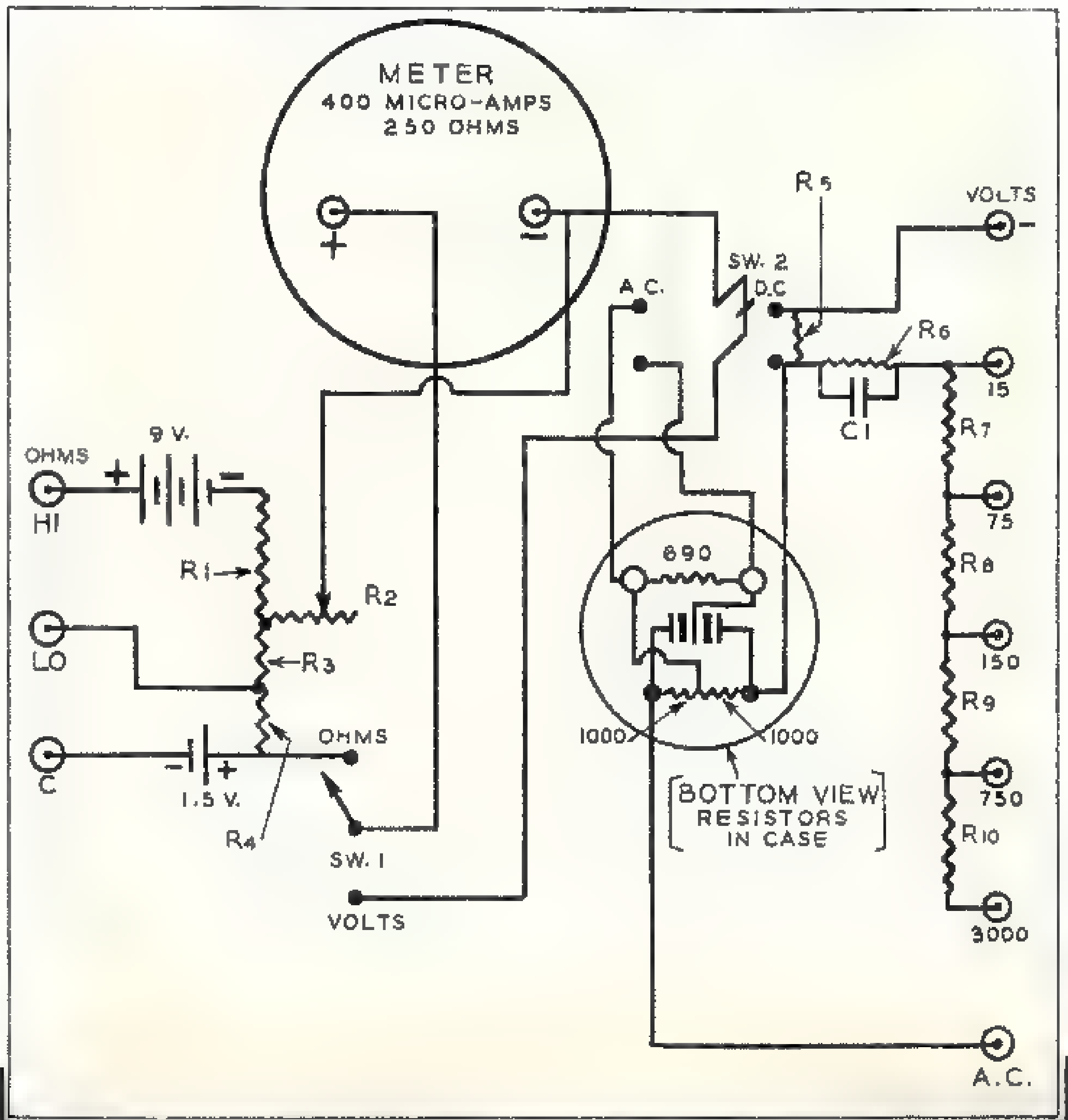
The heart of this instrument is the highly-sensitive but rugged bakelite-cased meter, which gives a full-scale deflection for 400 microamperes and has an internal resistance of 250 ohms. A knife-edge pointer enables readings to be made with precision over the various ohm and volt scales which are printed in red and black upon the dial. By the use of multipliers and shunts, five voltage ranges, from 15 to 3,000 volts, are secured. Switching in a copper-oxide rectifier adapts the meter to a.c. measurements over the same number of ranges. All ranges, both a.c. and d.c., are covered at 1,000 ohms per volt.

Two ohmmeter ranges are provided. The "Low" scale is calibrated from 2 ohms to 15,000 ohms, while the "High" scale covers from 200 ohms to 1.5 megohms. The full

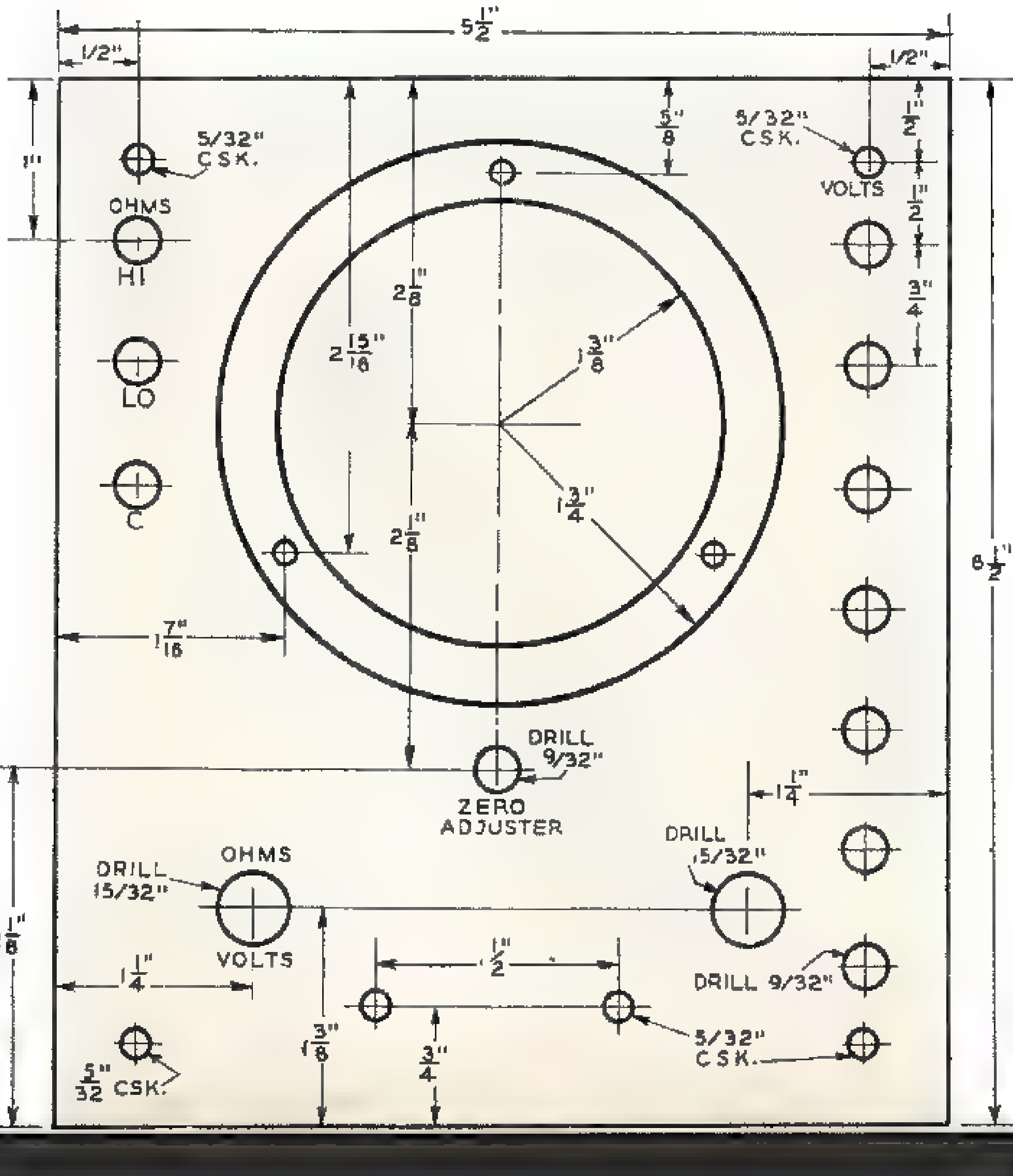
[*Continued on page* 136]

During the past few months many MI readers have written to us asking for information on amplifiers suitable for use with musical instruments. The result of all these letters will be found in next month's MI in the form of a complete how-to-build article on a musical instrument amplifier. Using only three tubes and contained in a single box with speaker, it has an output of approximately five watts—sufficient for medium size auditoriums. And this point will please many builders—it is not limited to use as a musical instrument amplifier. When desired, a microphone can be plugged in and the amplifier then can be used for speech, or, a phono-pickup can be substituted for the "mike" and the amplifier becomes an electric phonograph. Considering all its good points, we think this outfit is mighty good, and if you read the November issue of MECHANIX ILLUSTRATED you'll agree with us.

Above left—The completed Testmaster ready for use. It can be placed in a box for use on the workbench, or mounted in a panel above the table. Below—The wiring diagram. The a. c. rectifier with its parts are contained in a single unit. These parts are enclosed by a circle in the schematic diagram.



Above right—A photograph of the completed unit showing the parts. The rectifier is at the right, plugged into a 4-prong socket. Below—The panel layout showing locations of all holes to be drilled. The overall dimensions and positions of the parts can be varied to meet individual conditions.



Parts List

R1—Trutest wire-wound resistors
1—20,000 ohm and 1—2,000 ohm in series

R2—Midget potentiometer, wire-wound, 500 ohms

R3—Trutest wire-wound resistors
1—3,000 and 1—400 ohm in series

R4—Trutest wire-wound resistors
1—400 and 1—600 ohm in parallel

R5—Trutest wire-wound resistors
1—1,000 and 1—200 ohm in parallel

R6—Trutest wire-wound resistors 15,000 ohms

R7—Trutest wire-wound resistors
1—20,000 and 1—40,000 in series

R8—Continental Carbon semi-precision multiplier resistor, 75,000 ohms

R9—Continental Carbon semi-precision multiplier resistor, 600,000 ohms

R10—Continental Carbon semi-precision multiplier resistor, 3—750,000 ohms in series

C1—Tubular condenser, .05 mf., 200 volt

SW1—Single-pole, double-throw toggle switch, ½ inch shank

SW2—Double-pole, double-throw toggle switch, (included in meter kit)

Triplett Model 321 a.c.-d.c. Universal Meter, complete with copper-oxide rectifier, socket for same, and double-pole, double-throw toggle switch (SW2)

10—Bakelite Insulated ICA tip jacks (7—red, 3—black)

1—piece black Bakelite, 5½x6½x¼ inches (for front panel)

1—piece black Bakelite, 5x6x⅛ inches (for sub-panel)

2—Eveready type 781 4½-volt "C" batteries

1—Eveready type 950 1½-volt flashlight battery

1—pair ICA pencil-type test leads, No. 373

Brass tubing or rod, ¼ inch, 8 inches long, for four mounting posts

Brass strip, ½ inch wide, 1/16 inch thick, about one foot long, for brackets

Oval head and round head nickel plated brass screws, 6/32 with nuts

Push-back wire, assorted colors

FINDING THE WAY WHEN LOST IN WOODS

by J. Julius Fanta

THE confusing nature of forests frequently causes the "tenderfoot" hunter or camper to become lost, only to spend much precious vacation time finding his way out. One may only venture a thousand feet or so into a dense forest, let alone penetrate the interior, and lose all sense of direction. Strange but true, the direction-confused outdoorsman often aggravates his predicament by unwittingly going the wrong way.

Others may profit by the writer's experience, the outcome of a deer and bear hunt near Quemado, New Mexico. Like many another hunter, it was taken for granted that the way back to camp could be found without difficulty. It was this over-certainty that increased the mental confusion as to certain trees which were too casually noted for bearings. This was definitely deterring, because in looking for those "certain trees" hundreds of others looked exactly alike.

The result was, upon the realization of being lost, that the hunting trip turned into a hunt for camp. The mighty forest of tall pine, spruce and hemlock spread for miles. There was no food or ready shelter at hand, except game the rifles could drop. It was too late to take bearings, as none were taken at the start.

Half sheets of white paper pierced onto twigs or underbrush make excellent trail markers, as the paper is easy to locate at night with a flashlight. Laying out the course of a hand-drawn map also helps in finding the return route to the camp site. Woodsmen prefer maps rather than trail markers.

The sun, moss on trees and other natural directional aids would have served perfectly, if used at the outset. But they were ignored by plunging into the forest with deer and bear uppermost. The outbound trip ended at the brink of a canyon. Several hours of "going back" brought the hunting group to almost the same spot at the canyon. Cutting circles is a common occurrence for persons lost in a forest.

A rifle fired to attract attention was unanswered. No one else seemed to be in the vicinity. The afternoon passed and night came. One guess seemed as good as the next in determining bearings. Game was unsighted. Appetites bothered more than the plight. Darkness left no choice but to make preparations for an over-night stay.

A lean-to was built to provide improvised shelter by thatching a framework of saplings with light branches, leaves and grass. Fortunately, there were matches along to light a campfire, whose warmth substituted for blankets left at camp.

Dawn failed to furnish any helpful directional aid, the direction of camp having been unknown.

Crash! Crack! Bang! Clatter! The familiar sound of clattering pans and breaking of branches about 300 yards away sounded salvation. Haste was made toward the noise and lo! there was camp. And a black bear cub was seen scampering away, after breaking in for food and broadcasting welcome bearings.

This illustrates how near one may be to camp headquarters in a confusing forest, and yet be lost. The incident served to emphasize the necessity of mapping the way on future expeditions. With carefully recorded bearings, camp was found immediately after another jaunt that awarded a deer.

There are various ways of finding the way out of unfamiliar country where there are no landmarks to aid. A compass or a watch is indispensable on hunting and camping trips. With a compass, the directions may easily be determined while tramping, and the course retraced. If the course is frequently changed during a forest excursion, the length of time spent in going each direction should be noted and written down.

Be sure to note time taken out for rests and lunch. Then, using the opposite compass reading, a corresponding time is spent on each leg on the way back. That is, if the outbound course is northwest, the return would be southeast. The return of north-northeast would be south-southwest, etc.

If the departing course is roundabout over a series of logs, a short-cut route back to camp or starting point can be plotted by simple methods. Determine a straight return trip by accurately reproducing a compass "rose" on a drawn map.

Draw a straight line from the starting to the stopping point. Draw parallel lines to the line of proposed return route toward the compass rose until one intercepts the center of the rose. The line through the rose-center

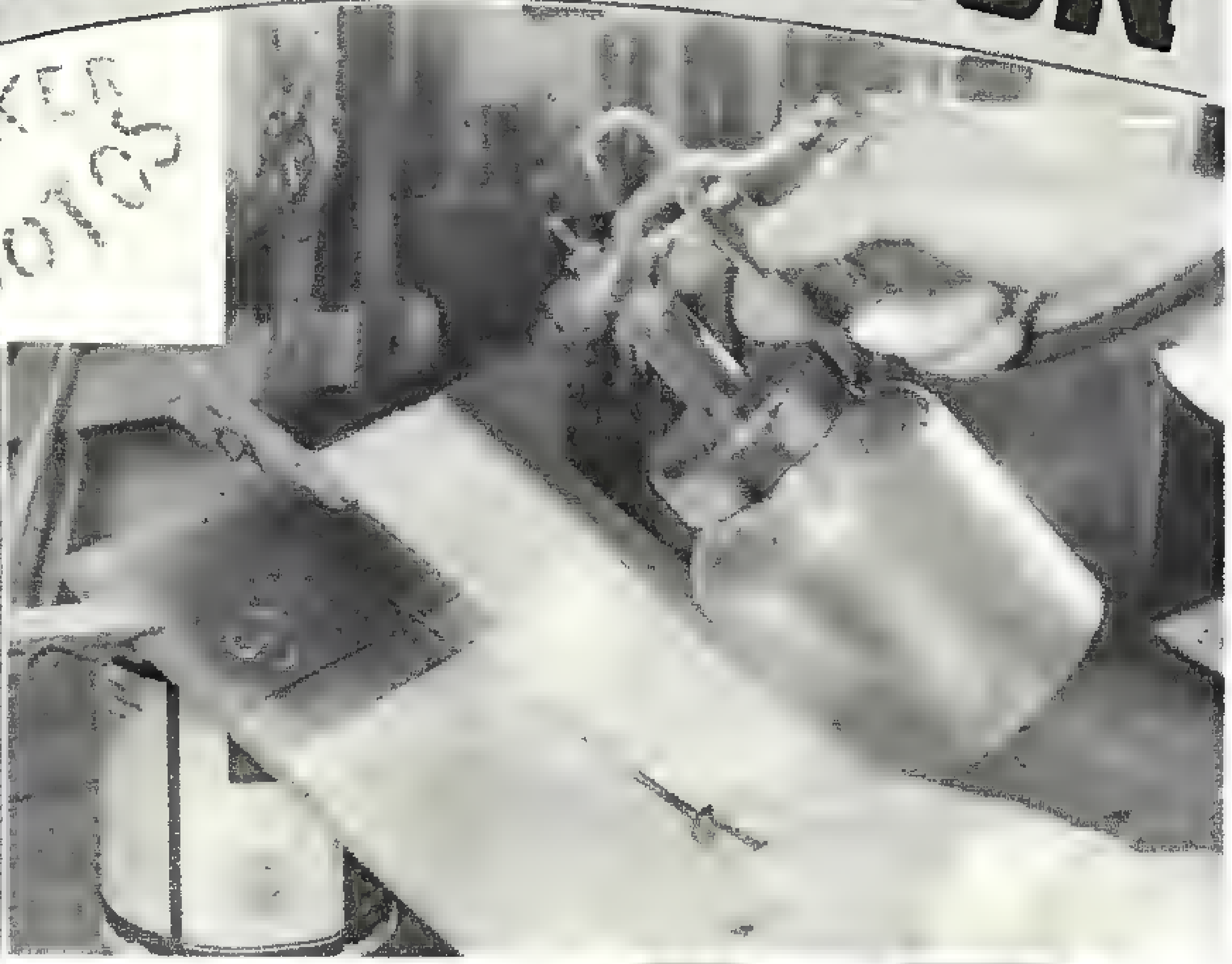
When one is lost in the woods, a "lean to" shelter for protection against the elements can be built in a few hours. Lashed saplings and straw were used as materials in building this shelter.

• • TRICKS WITH A PAINT-SPRAY GUN

How to use lacquer to produce very attractive finishes.

by Walter E. Burton

SNEAKER PHOTOS



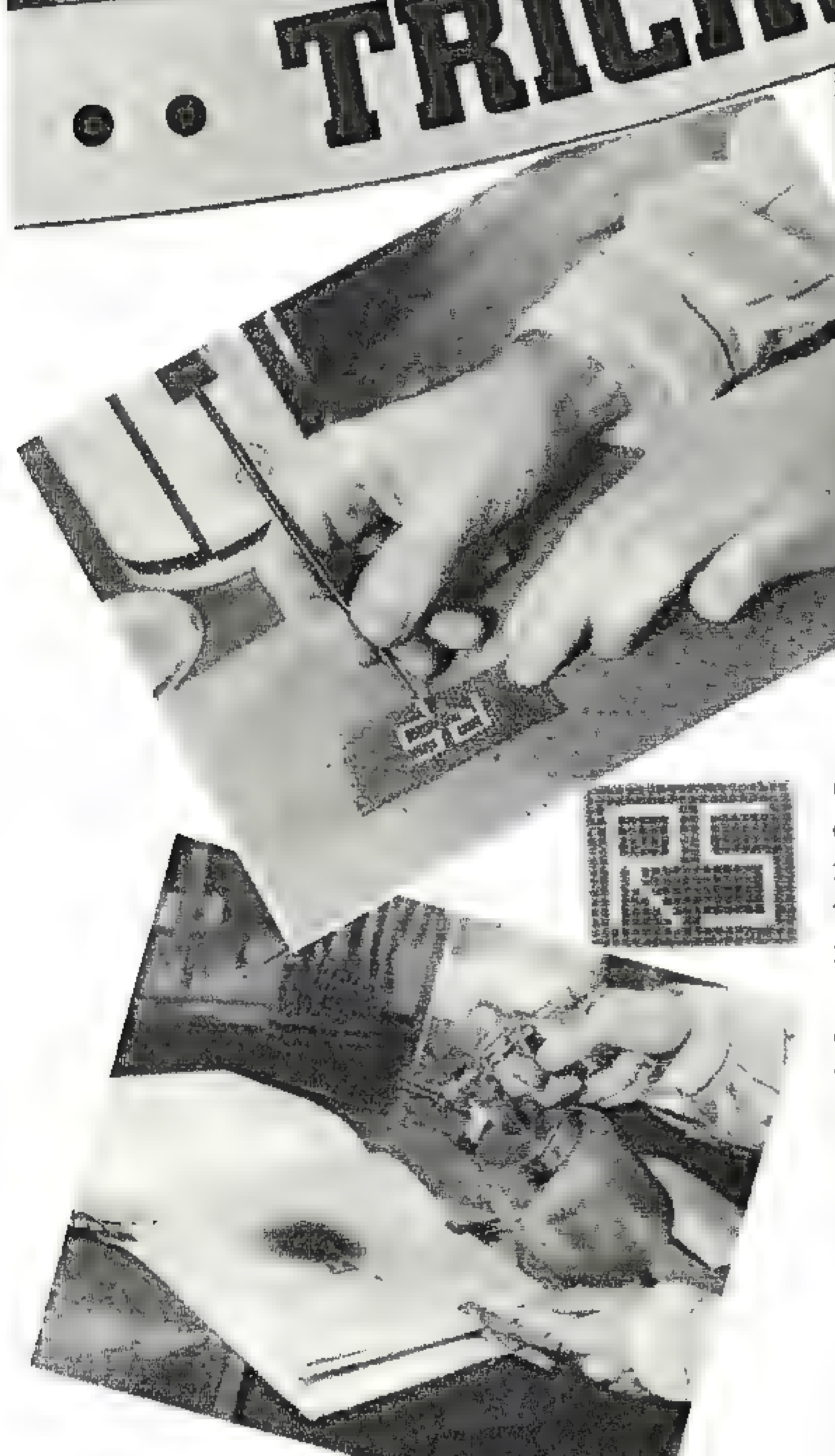
INEXPENSIVE paint-spray guns, operated usually by small motor-driven compressors, offer to the home-workshop owner a means of producing distinctly novel and attractive finishes on various objects, in addition to those obtained by usual straight spray-painting methods.

For most of the stunts to be described, quick-drying lacquers are to be preferred to the slower-setting spraying enamels. In most cases, the lacquer should be made water-like in consistency by adding a little more than the usual amount of thinner. Set the gun so that it gives a very fine, misty spray.

Almost unlimited are the effects to be obtained from using stencils, and various objects and materials that act as stencils by preventing the depositing of lacquer on some areas while permitting it in others. A piece of ordinary screenwire can be used to give novel effects. Hold it flat against the work, direct the spray squarely against it, and you will produce a clean-cut pattern of the wire. By holding the gun so that the spray strikes the wire at a sharp angle instead of perpendicularly, you obtain an entirely different effect. Support the wire a small fraction of an inch from the work, and still another effect is obtained.

It is an easy matter to make stencils for producing designs and lettering, by filling some of the squares in a piece of screenwire with some material that will prevent the lacquer spray from reaching the surface being painted. One suitable material is spraying-enamel undercoater or the enamel itself. These are not readily softened by the lacquer solvent. However, with care, almost any paint or lacquer can be employed. Use a small artist's brush for filling the openings; do not have the filler too thin. When the filler has dried, simply hold the screenwire stencil against the surface to be painted, and direct the spray squarely toward it. Do not apply too heavy a coat, and do not attempt to move the stencil until the lacquer has set so that it will not smear. The resulting pattern will be composed of unpainted letters or figures against a background divided into small squares.

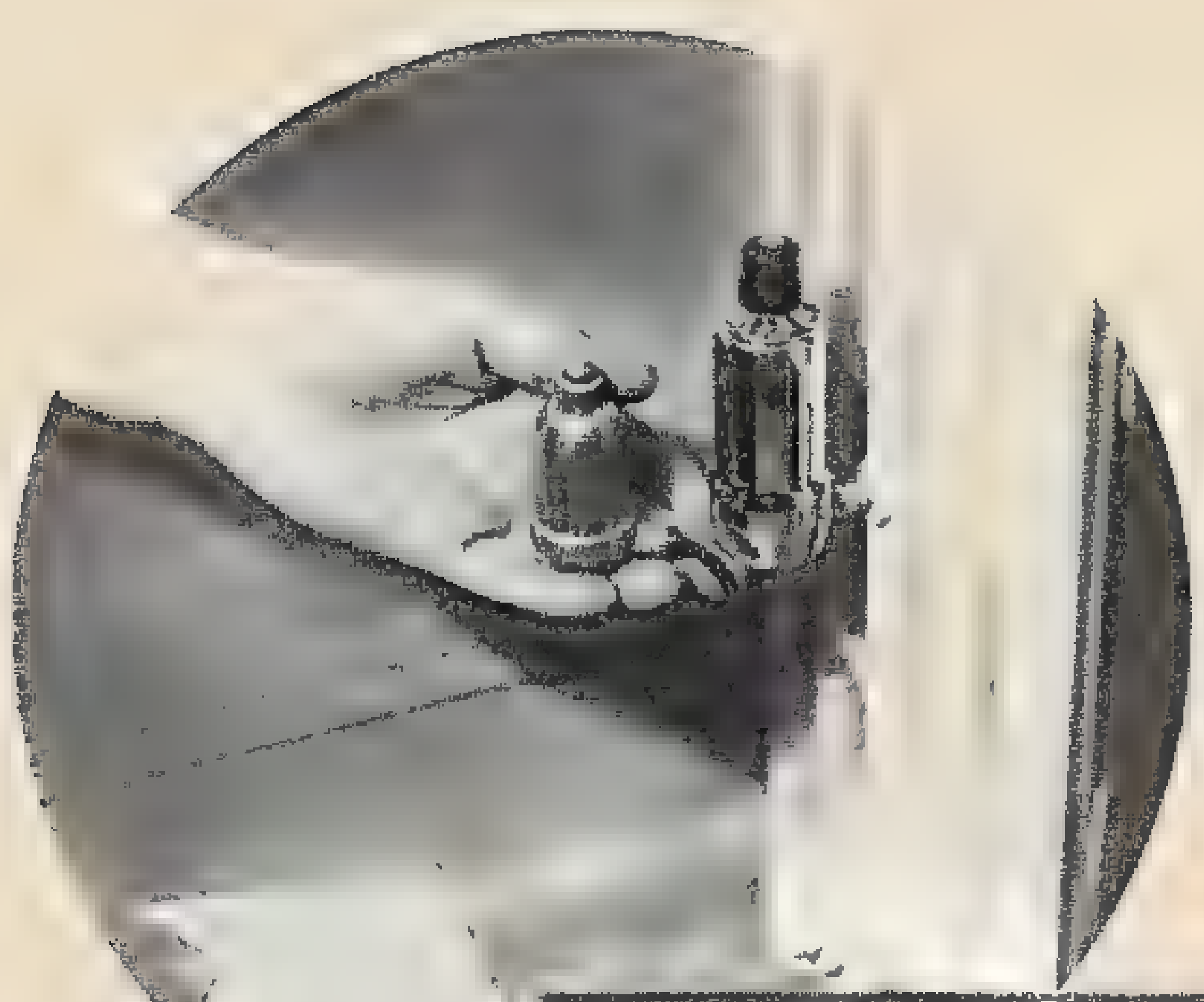
Another trick is to use an ordinary stencil cut from heavy paper or thin cardboard, and



Letters or designs painted on wire screening make an interesting stencil. This is useful for giving books permanent ownership identification.

Simple objects such as nails or washers make good stencils for the paint spray gun. By changing the direction of the paint spray, design can be varied to give desired effect.

Vacuum VALVES SAVE FUEL



The valve held in the hand is the ordinary air valve. The one fastened to the radiator is the vacuum type. Note its larger size.

EVERY home owner who is concerned about the cost of fuel (and what home owner isn't?) should investigate the possibilities of savings by vacuum valves. When installed in a heating system of the one-pipe steam type, which is the most popular type in small homes, these valves as a general rule bring about an appreciable reduction in the amount of coal or oil burned. They are considerably more expensive than ordinary air valves—they cost between $2.00 and $4.00 each as compared to 50 or 75 cents for air valves—but they must be looked upon as an investment that will repay itself in a short time. While of course fuel consumption is a matter of the individual house—the condition of the boiler, the exposure of the house, its insulation, weatherstripping around doors and windows, and other factors—the experience of heating contractors over a period of years definitely indicates that this cost will be returned to the purchaser in reduced fuel bills.

When heating men suggest vacuum valves to their customers, the latter always ask, "What's the difference between vacuum valves and ordinary ones?" The explanation is very simple.

In any steam heating system, water is heated in a boiler until it forms steam. This rises through the connected piping pushing the cold air in the pipes ahead of it. The function of the valves on the radiators is to let the cold air out. Once the radiators fill with steam and become hot, the valves are supposed to close. The live steam is thus imprisoned and gives up its heat to the fins of the radiators, which in turn heat the surrounding air in the room. As the fire dies down (in the case of a coal burner), or the burner goes off (as with an oil burner), the supply of steam in the pipes diminishes, and after it has given most of its heat to the iron radiator it cools off and condenses back into water, which runs back into the furnace. Meanwhile, the valves also cool off and soon their vents open, permitting air to re-enter the pipes. Cheap valves have a tendency to open too soon, and the air they admit hastens the cooling of the thin steam vapor and pushes it back into the pipes and to the furnace. This rapid cooling of the radiators is more noticeable with oil burners than with coal, as steam pressure is "up" only when the burner is in operation. During "off" periods the steam is practically dormant in the pipes and is easily affected by the pressure of the air that enters via the valves. In coal furnaces there is a fine smoldering all the time, and, depending on the adjustment of the draft, there is some slight steam pressure to counteract the air pressure. The latter nevertheless is undesirable.

Vacuum valves are designed to be truly "one-way" vents. When steam comes up the first time, it pushes the residual air through the pipes and out of the valves, as before, but this time the valves close and *remain closed.* The advantages of this reliable seal against air becomes obvious immediately. The steam remains in the pipes until it has given up all its energy to the iron radiators. When it finally condenses and becomes water again, returning to the furnace tubes, the space it formerly occupied becomes vacant. Since air cannot enter by way of the valves, the space stays empty—in other words a partial vacuum is formed there.

When steam comes up during the next cycle of burner operation, as controlled by a room thermostat or by hand adjustment of the dampers, it comes up much more quickly than before, for two reasons: 1—There is no air resistance for it to overcome; 2—Steam forms much more readily in the absence of atmospheric pressure on the surface of the water being heated in the boiler. In practical terms, this means that the burner works for a shorter period and uses less fuel to produce a given amount of "steam heat" than if air were present. The fact that the steam stays in the pipes longer and comes up more quickly when needed means that a more uniform temperature will be maintained in the house, especially with oil burners. With ordinary valves, radiators cool more quickly, and by the time the burner has again responded to the room thermostat the house is chilly.

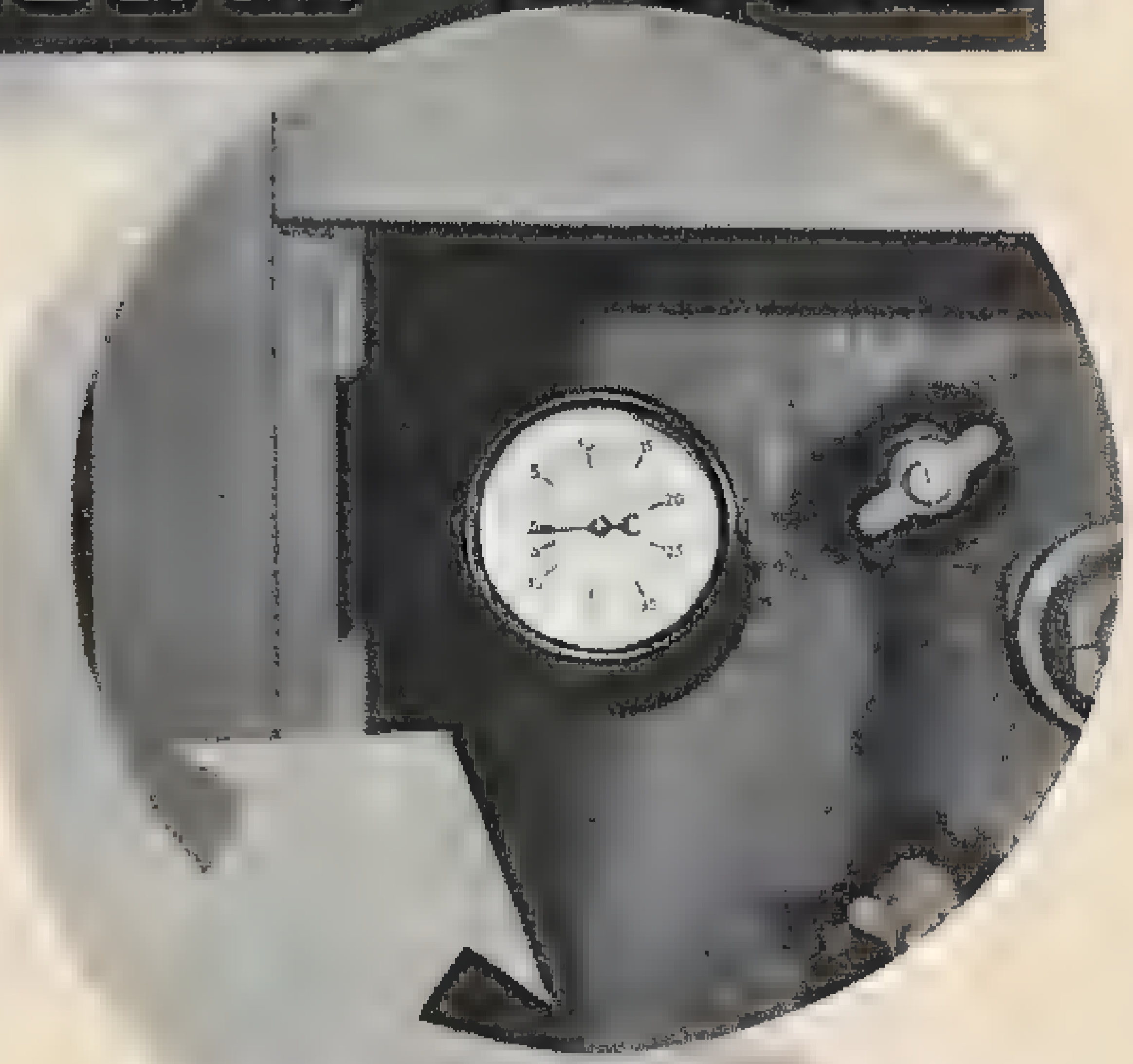
It is evident that the entire piping system must be completely air tight if the vacuum valves are to do their work properly. Many persons overlook this point and then complain bitterly after finding that the vacuum valves haven't increased home comfort a bit. Fortunately, the job of "vacuumizing" a one-pipe system is very simple and is easily done by any home owner who is handy with tools.

The first step is to clean the boiler thoroughly with a good cleaning compound, following the instructions on the can. After draining the tubes and refilling with fresh water, fire the boiler or turn up the room thermostat to 80 degrees or so to build up several pounds of pressure of steam. Inspect all radiators and fittings and listen for signs of escaping steam. It is a good idea to repack the hand valves on the radiators whether they appear to need it or not. A 25-cent can of graphited asbestos metallic packing and a wrench from the car will do the trick. The boiler glass gauge is usually a leaky element and it too should be repacked. A few cents will buy all the rubber washers needed for the purpose. Be sure to turn off the cutoff cocks leading to the gauge before loosening the retaining nuts, otherwise you will get a bath of hot water from the boiler.

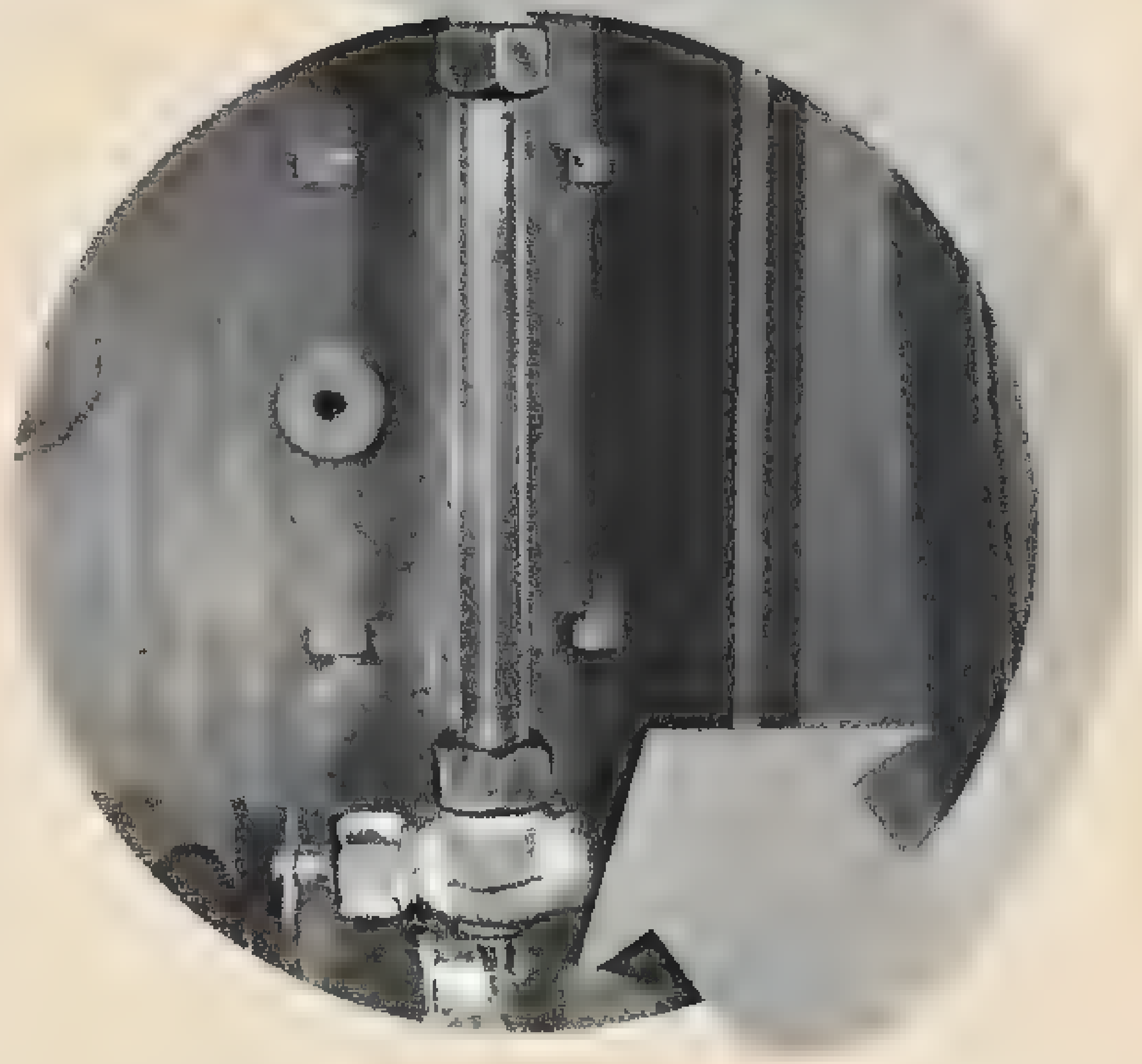
If the present pressure gauge on the furnace reads merely in pounds from 0 to 30, it must be replaced by a compound gauge, which reads pressure in pounds on one side and inches of vacuum on the other.

Remove the old air valves from the radiators and replace them by vacuum valves. Start the latter in the radiators and after about three turns coat the stem with white lead or any pipe sealing compound. Then complete the job by tightening the valves in an upright position.

[*Continued on page* 112]



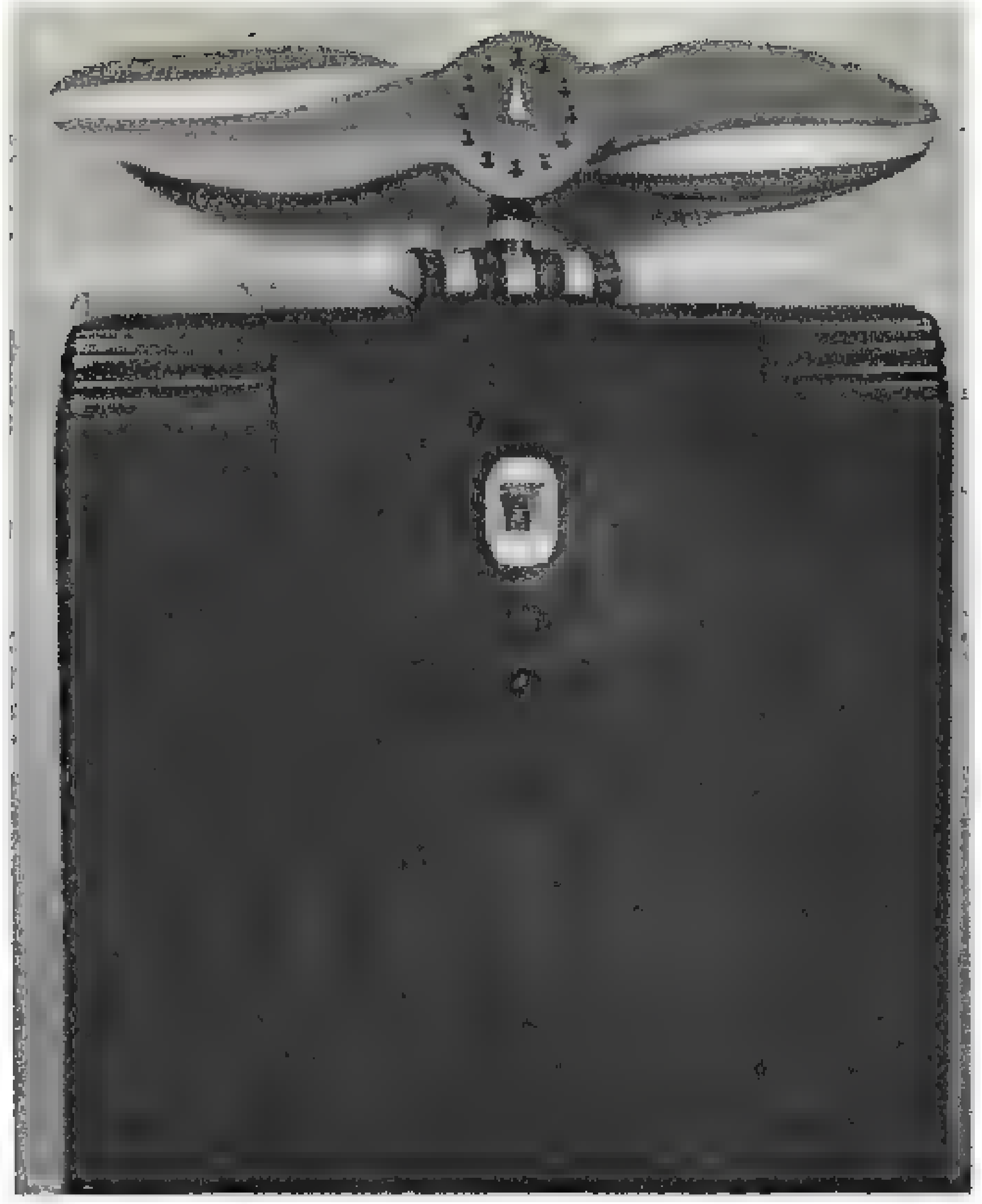
Above—This is type of double reading gauge which should be used with vacuumized heating system. Below—Water gauge fittings should be repacked to eliminate possibility of air leaks.



a handsome "Prop" Clock

For Den and Mantle

by Ralph T. Moore



The completed prop clock standing on a radio in the living room. Note that the wood used is in two colors, adding to the attractiveness of the finished product.

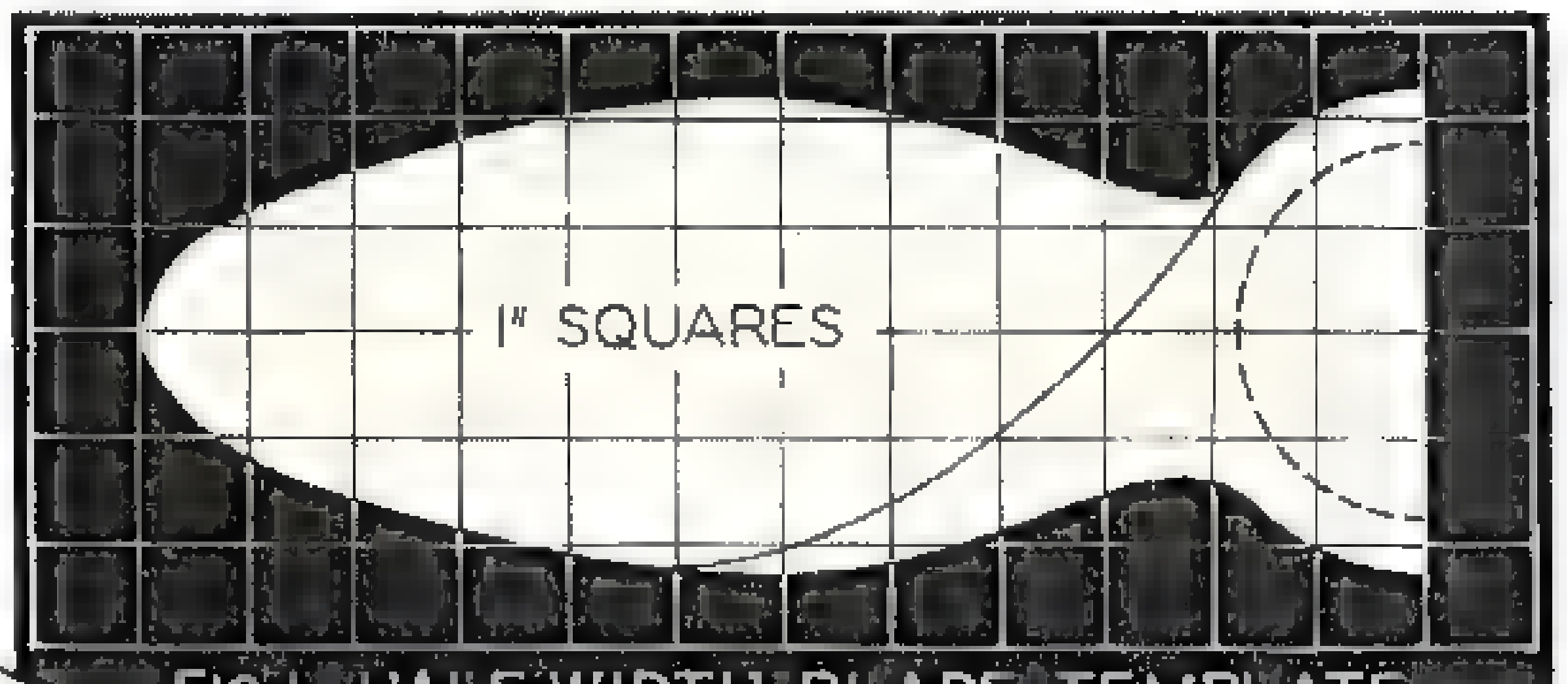


FIG. I HALF-WIDTH BLADE TEMPLATE

THE handsome wooden propellers of a day just past in aviation history have always made attractive decorative pieces and have been suggestive of highly romantic exploits. This is no less true of the propeller clock here illustrated and its size renders it a bit more adaptable as an ornament than a full size "sky churner." The construction of this piece is in no way difficult and anyone who has ever whittled out a small propeller will have no trouble making it. The only requisite is the patience to sand the finished article and then sand some more.

The propeller shown is of laminated construction and the beauty of the woods selected will determine the beauty of the finished piece. Of course a dark wood and a lighter one are selected and it is suggested that red gum or mahogany is used for the dark wood and spruce or Michigan white pine be used for the light. After the wood has been selected, two pieces of each color 4½" wide ¾" thick and 2′ long are laid out from the pattern shown in Fig. 1. The half pattern is used to insure accurate marking. These are then sawed out on a band or jigsaw and the center is sawed or bored out with an expansion bit to a diameter of 3½". This is done on three only, as the front or face piece is not bored through but is bored to allow ⅛" of material at the front as shown in Fig. 4. This will of course have to be done carefully, drilling until the worm just breaks through. Then remove the material between

[Continued on page 134]

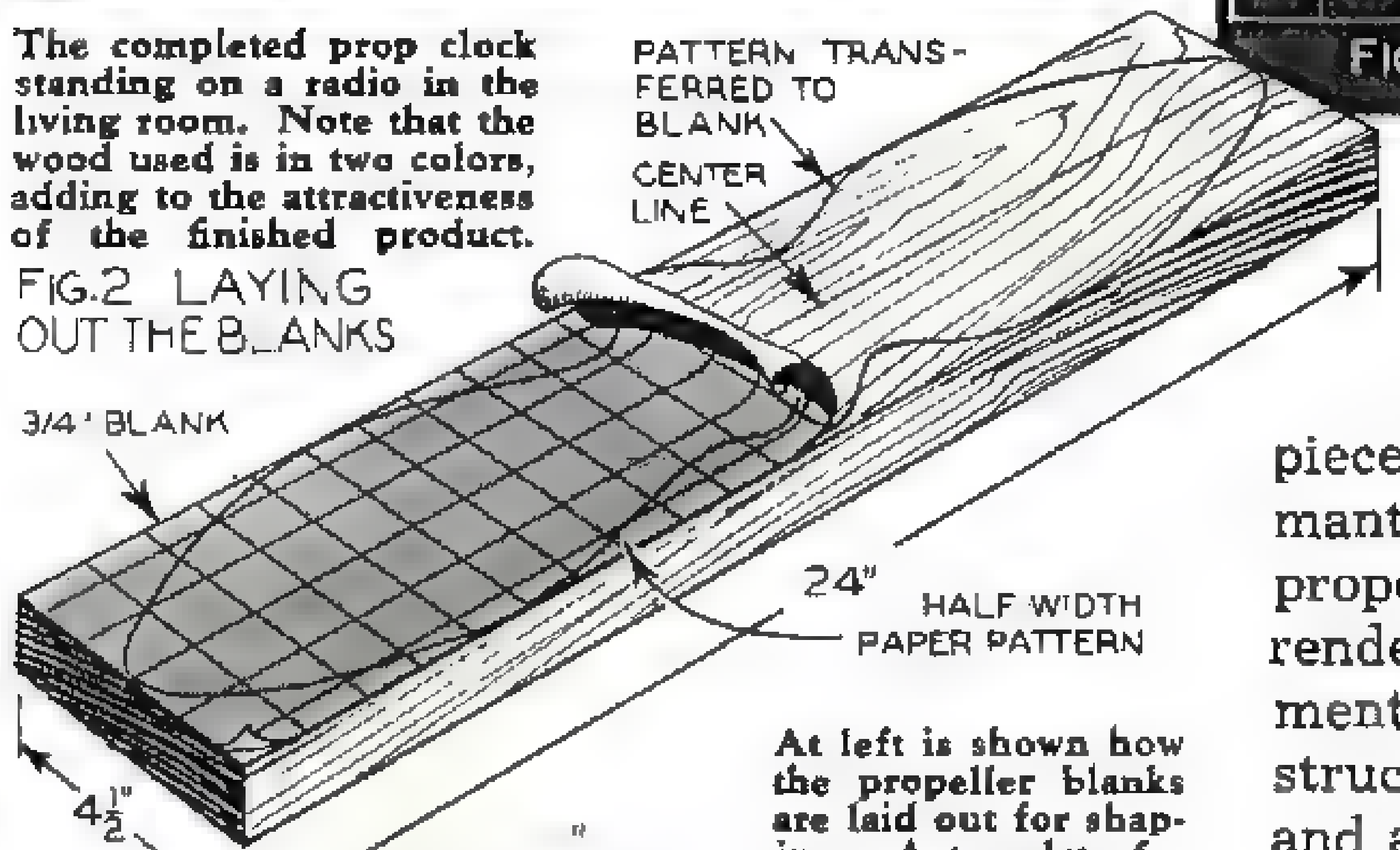

PATTERN TRANSFERRED TO BLANK
CENTER LINE
3/4" BLANK
24"
HALF WIDTH PAPER PATTERN
4½"

FIG. 2 LAYING OUT THE BLANKS

At left is shown how the propeller blanks are laid out for shaping. A template for obtaining the outline is given above right.

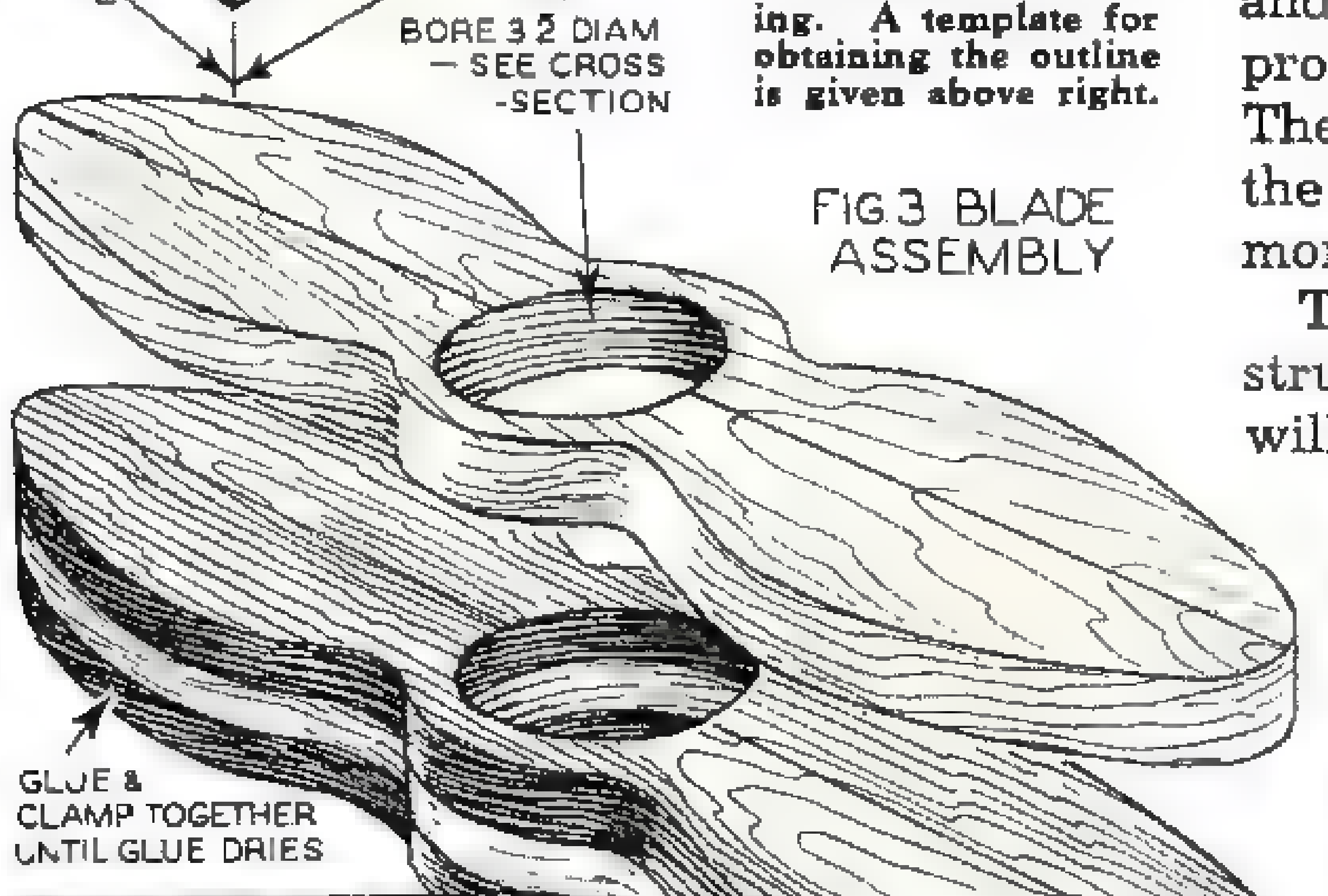

BORE 3½" DIAM — SEE CROSS-SECTION
GLUE & CLAMP TOGETHER UNTIL GLUE DRIES
FRONT LAMINATION

FIG. 3 BLADE ASSEMBLY

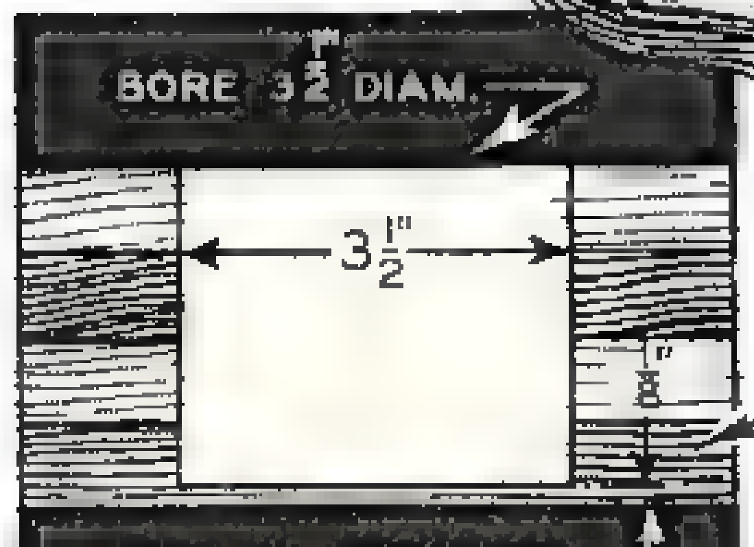
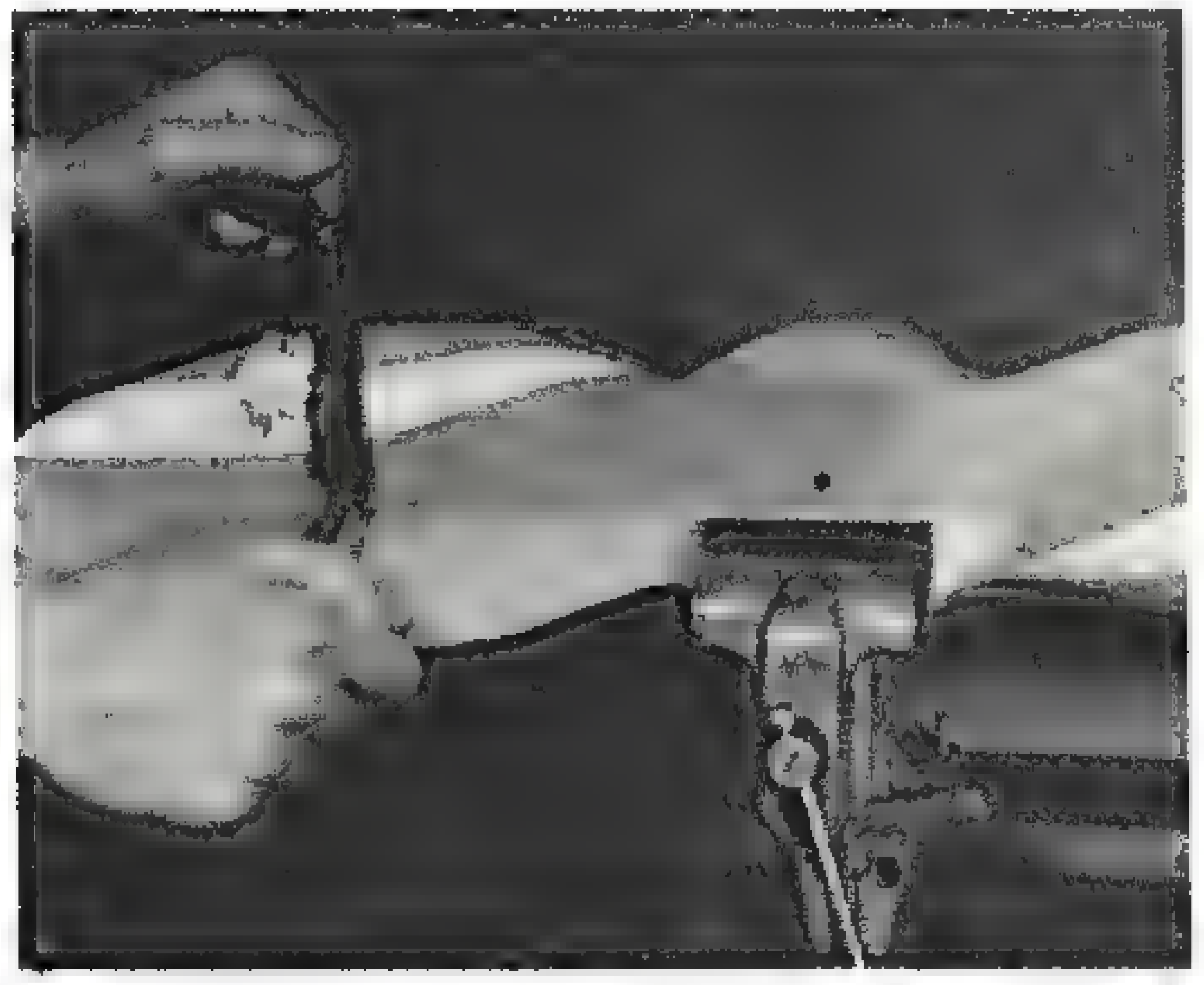
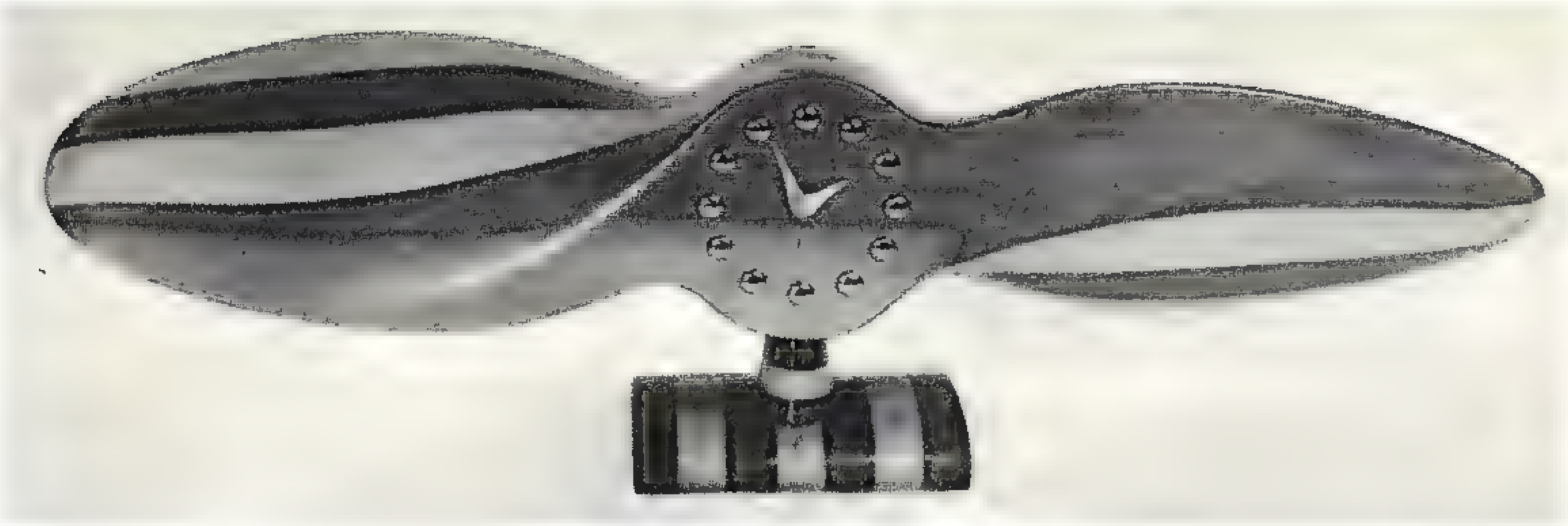
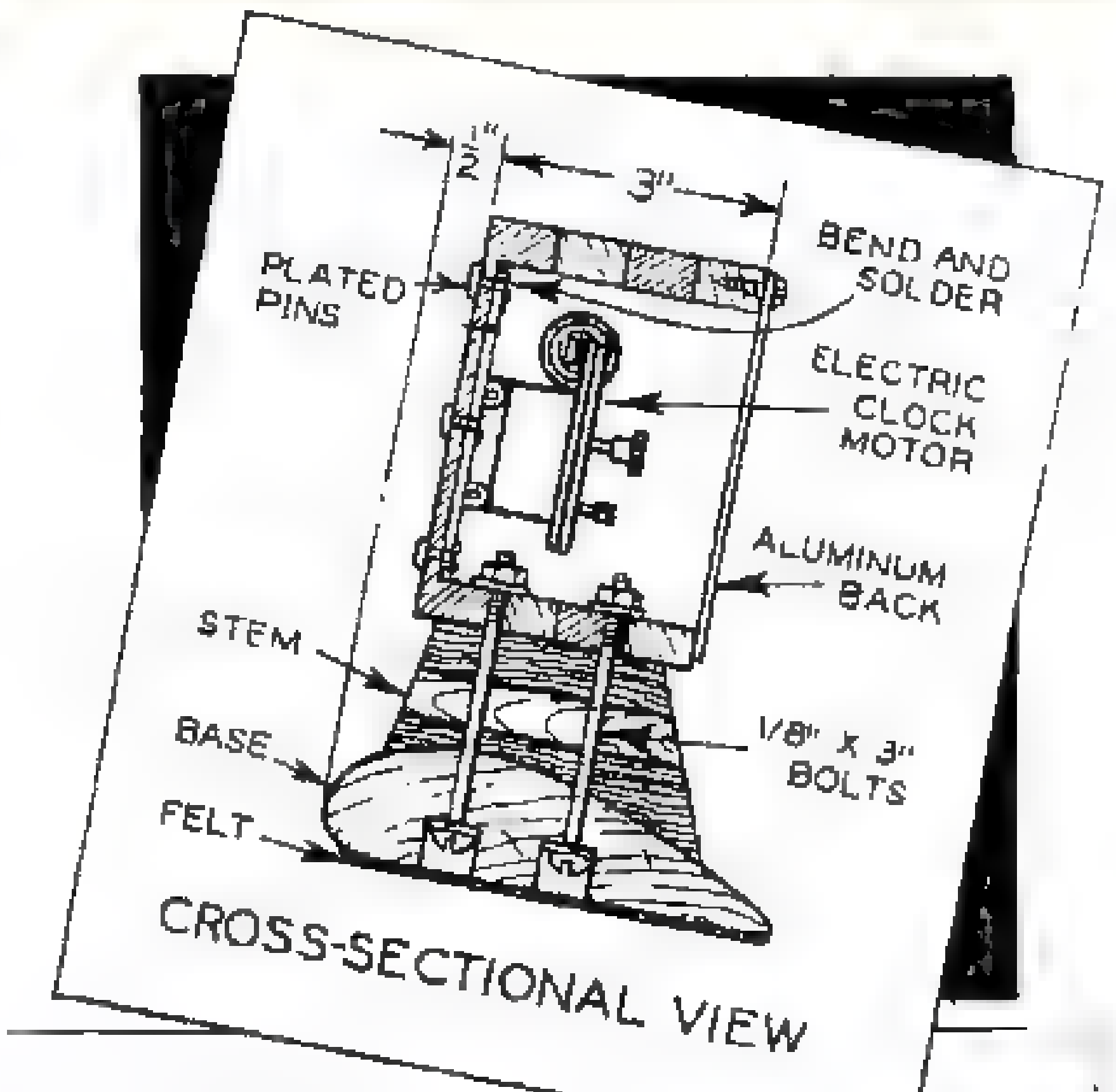

BORE 3½" DIAM.
3½"
⅛"

FIG. 4 DETAIL OF HUB BORE

The propeller is made up of four layers of wood. The colors should be alternated, the darker being placed on the front. Right—Fig. 5. A drawknife is used for cutting the blades to the correct pitch.






½"
3"
PLATED PINS
BEND AND SOLDER
ELECTRIC CLOCK MOTOR
ALUMINUM BACK
STEM
BASE
FELT
1/8" X 3" BOLTS

CROSS-SECTIONAL VIEW

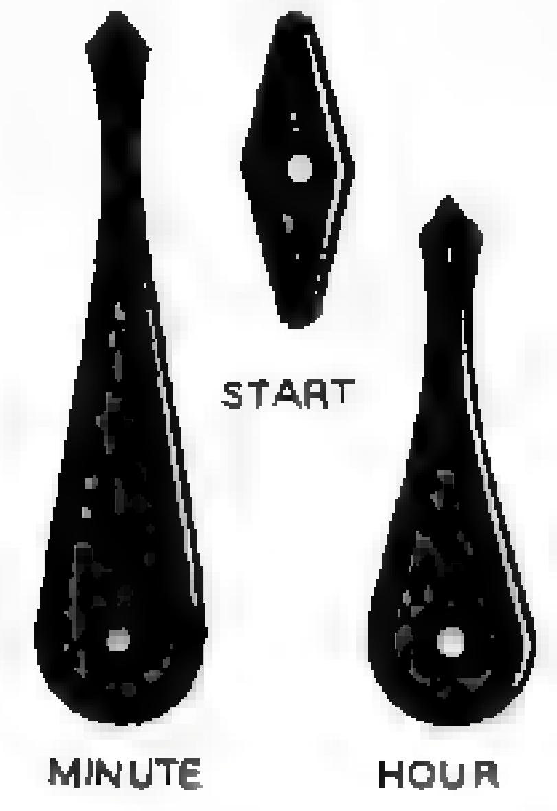

START
MINUTE
HOUR

FIG. 8 FULL-SIZE HAND PATTERN

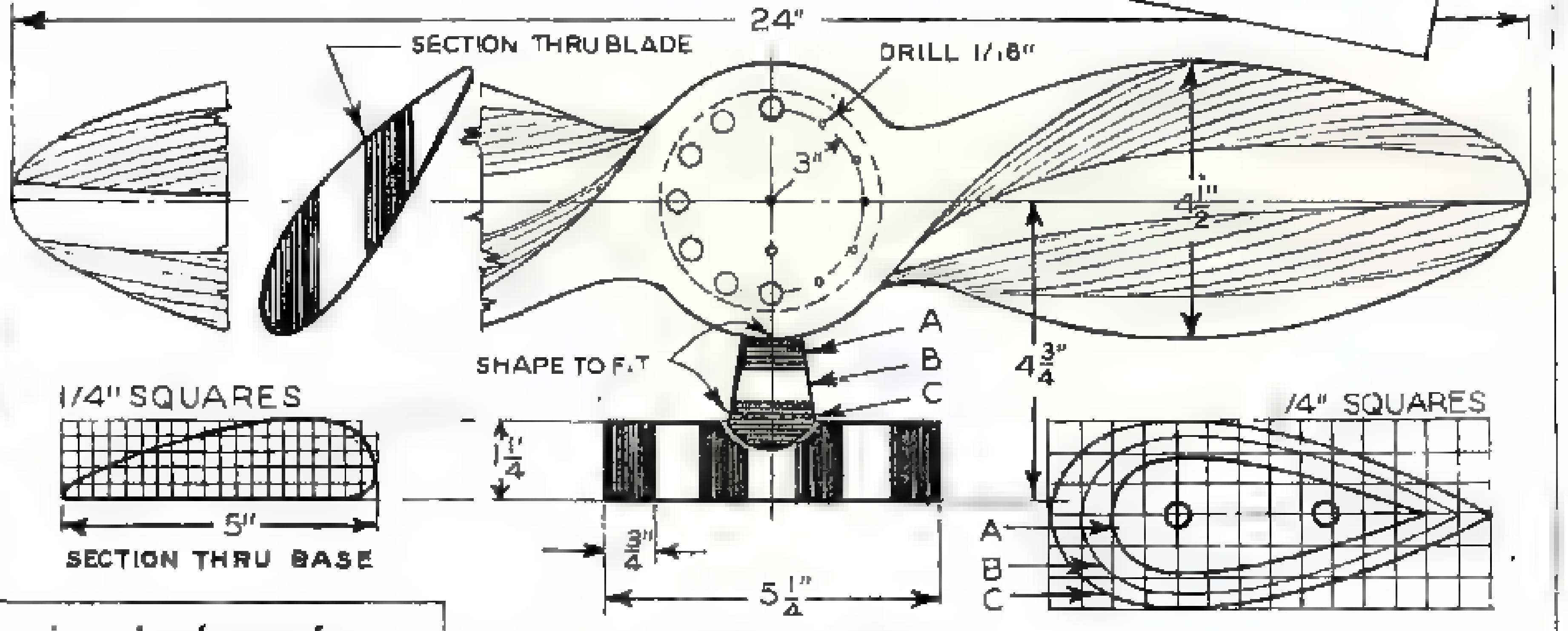
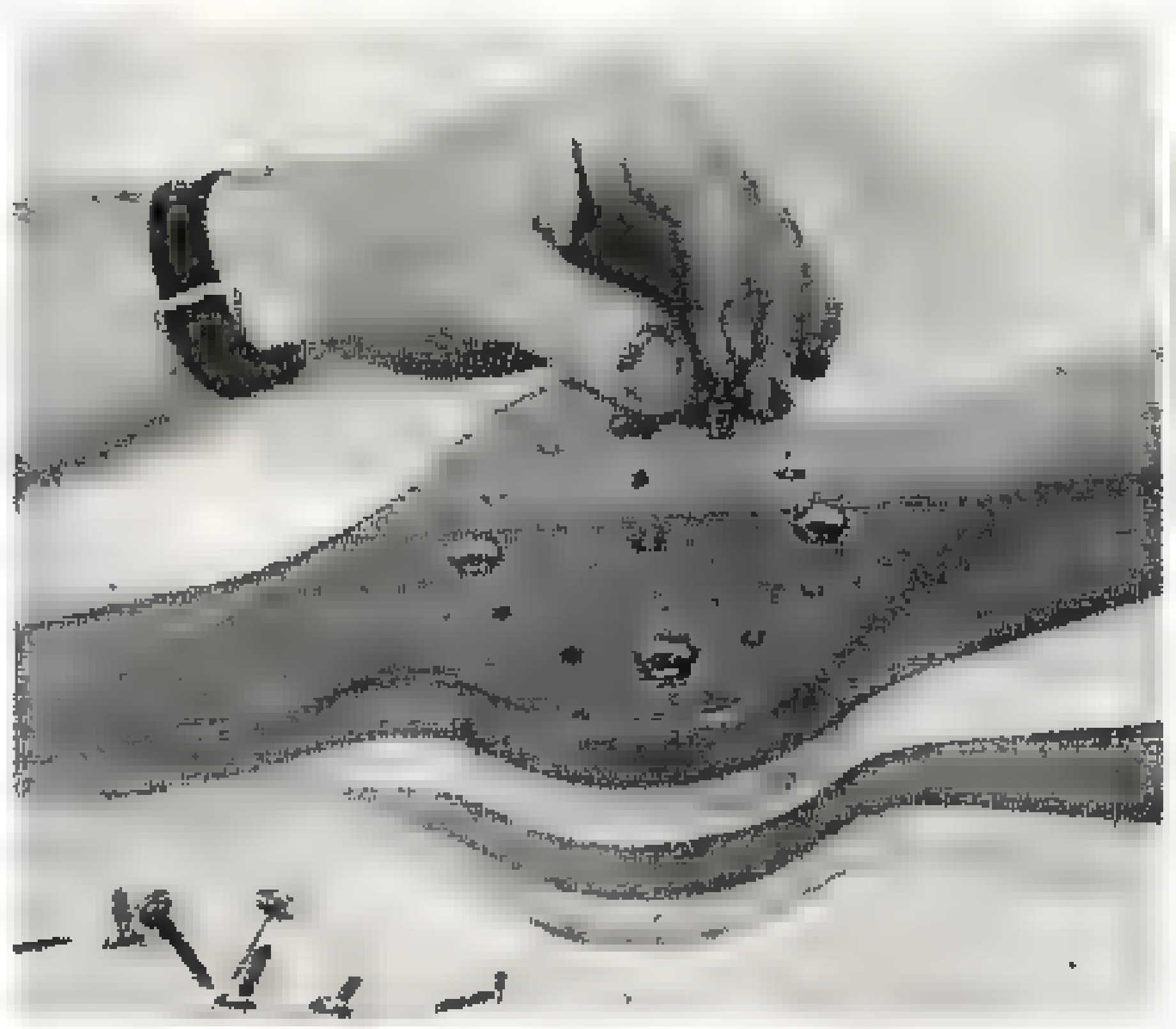

24"
SECTION THRU BLADE
DRILL 1/18"
3"
4½"
4¾"
SHAPE TO FIT
A
B
C
1/4" SQUARES
5"
SECTION THRU BASE
1¼"
¾"
5¼"
/4" SQUARES
A
B
C
SECTION THRU STEM PIECES

FIG 7 GENERAL ASSEMBLY

Fig. 6, below. Four chromium plated paper fasteners are used to hold the motor in place. The other eight take their positions around the circle in place of the conventional clock numerals.



Below—The motor to be installed in position in the hub.

Seeing Things at Night

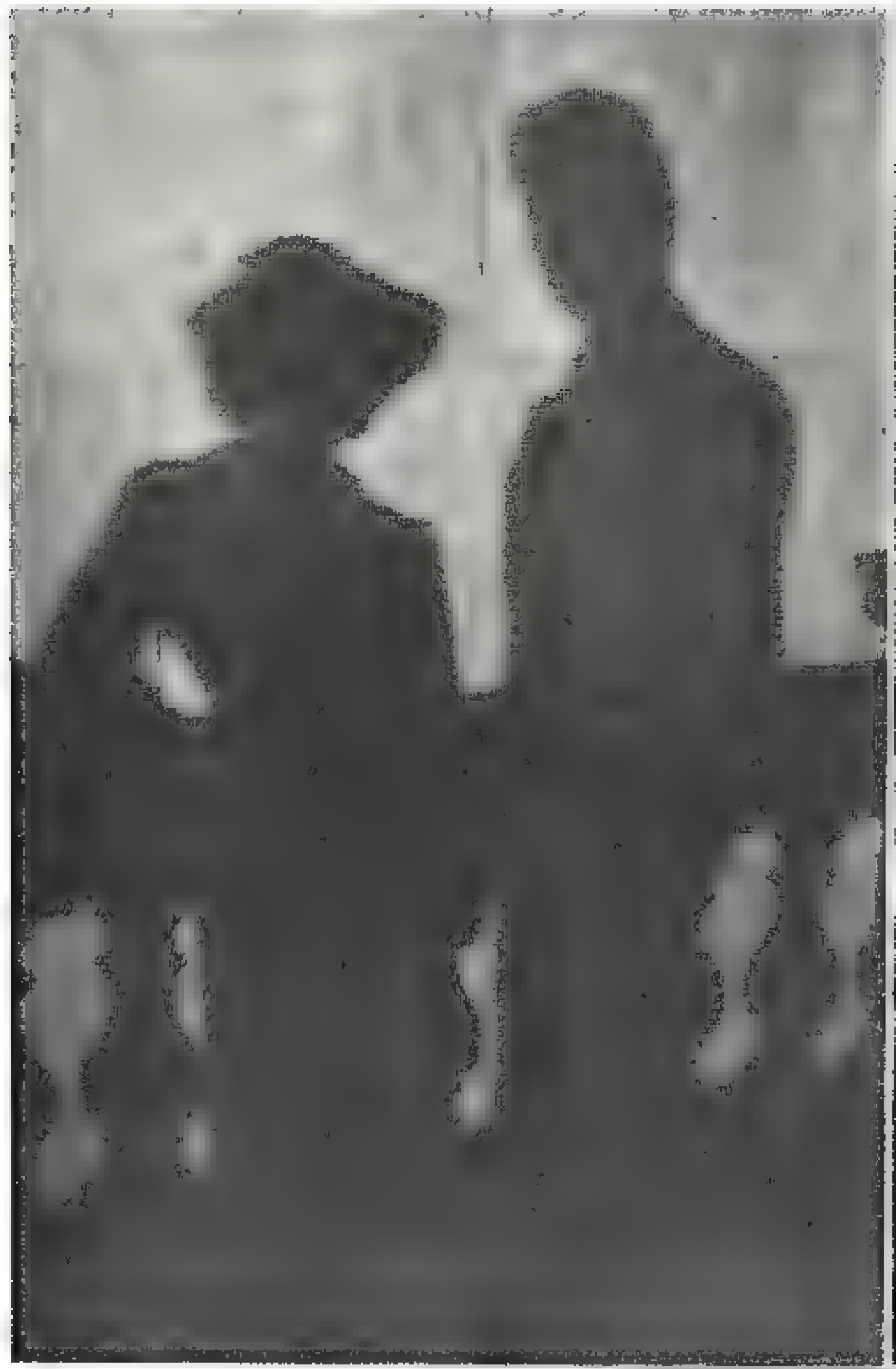
by John R. Whiting

Above—Factory in silhouette at night makes a striking photo. White lines are from auto headlights. Left—Three minutes at f-6.3 with camera on a tripod got this night scene. Note reflections in water.

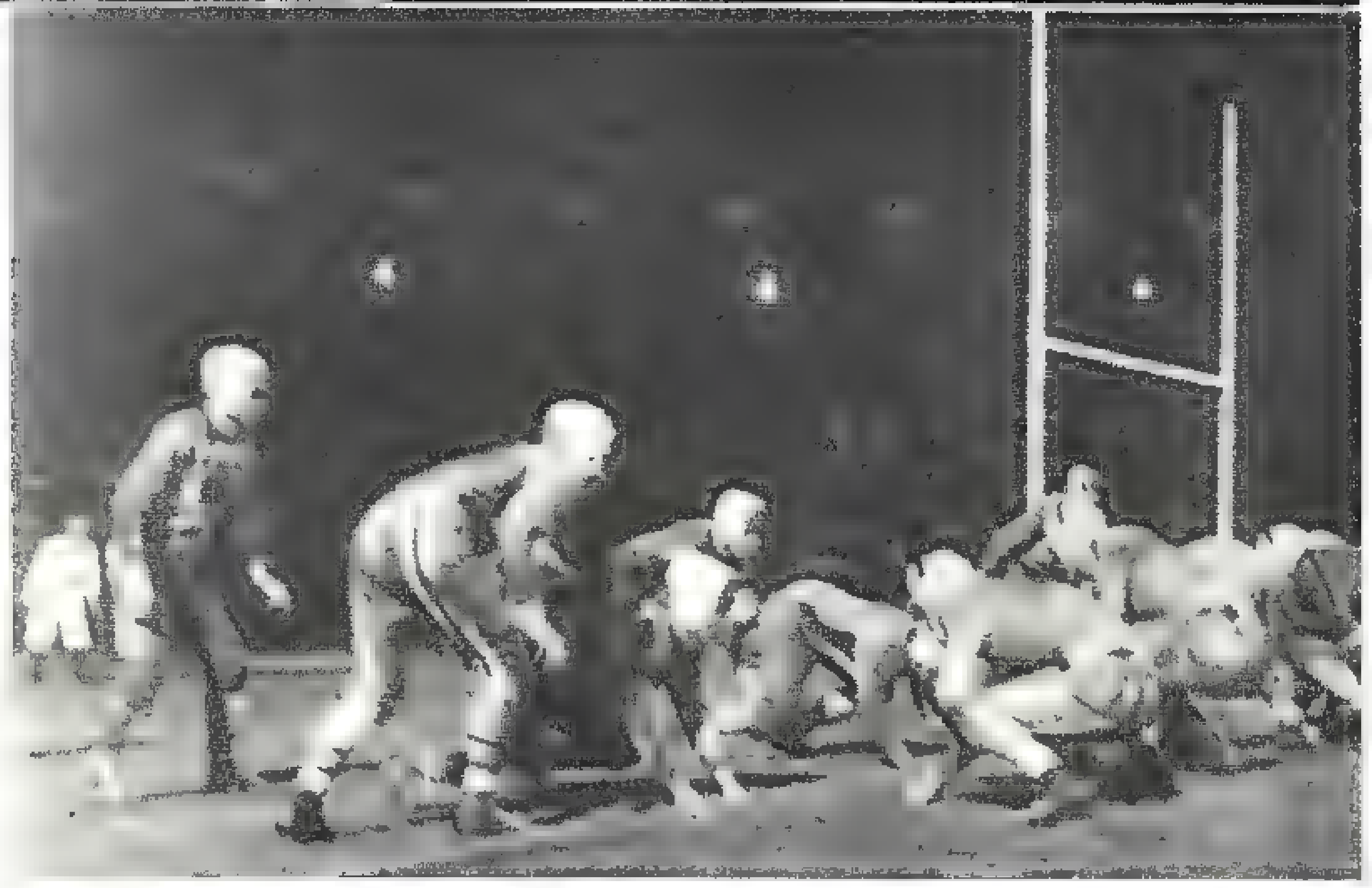
AFTER the sun burns red behind long-streaked clouds, when blackness settles over landscapes, and only moonlight, lightning flashes and lonely street lights sparkle in your view-finder—that is the time to take the best photographs.

Take your camera out at night! Get the solid blacks, the beautiful, glowing high-lights, the sharp silhouettes that only nocturnal picture-taking can give you. It's easy, whether you have a cheap box camera or an expensive super-super, complete with fast lenses, tripod and chromium gadgets. You need a "time" setting for your shutter, and a steady support—nothing more. Not even ultra-speed film is required, for some of the best night shots have been taken with pin-hole cameras and slow film.

Try something you already know by sunlight. An old church in the moonlight, or a picturesque flight of stone, steps glinting under an owlish street lamp. Try something commonplace—a pile of burning leaves or your own house with every window lighted up; it will look ten times more glamorous by night.



Above—Silhouette made at f-3.5 in 30 sec. Above right—50 sec. at f-6.3. Wet streets gave interesting reflections. Right—An f-3.5 opening at 1/10 sec. was enough to stop this night football scene. Newsmen would use a flash for it.



Getting glamour in night photographs is easy if you remember a few simple rules:

1. Select a clear evening, for sharpness, unless you have a special cloud and fog effect in mind. A clear night after a rain is good, for you get sparkling reflections.

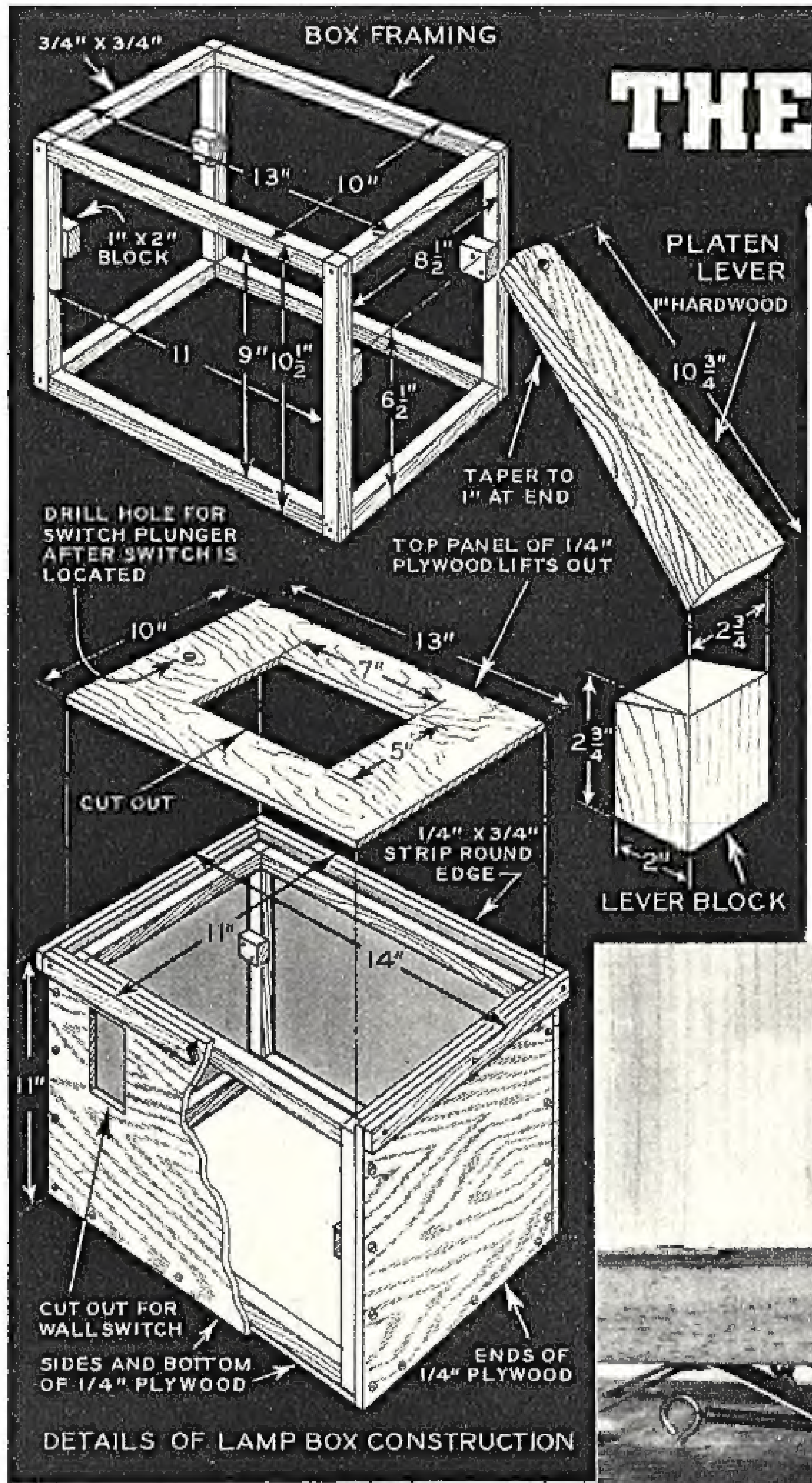
2. Watch your composition especially, for when you've nothing but high-lights and rich, black shadows you can't make up for lack of interest with a girl in a bathing suit and a big smile. Try to pick a center of interest, some simple pattern of stairs or a row of street lights or a startling silhouette and frame it just off center.

3. Make sure your camera has a steady support. If it's on a tripod, beware of vibrations and of brushing carelessly against the legs. If you have no tripod, don't worry; you can securely place even a box camera on a rock, on top a fence post, or perhaps on the roof of your car.

4. Take plenty of time. Long exposures will get detail. Try an ordinary scene such

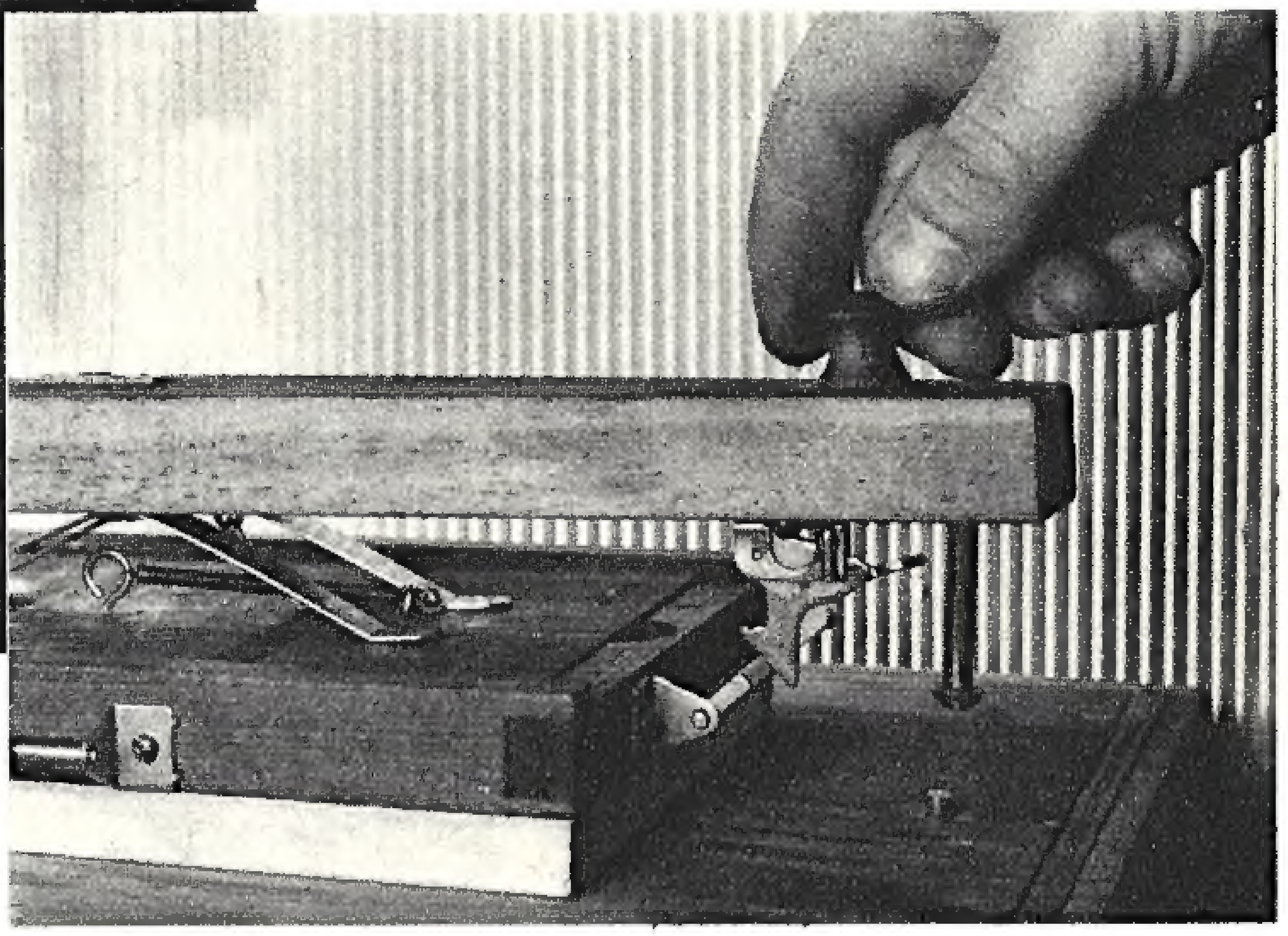
[*Continued on page* 137]

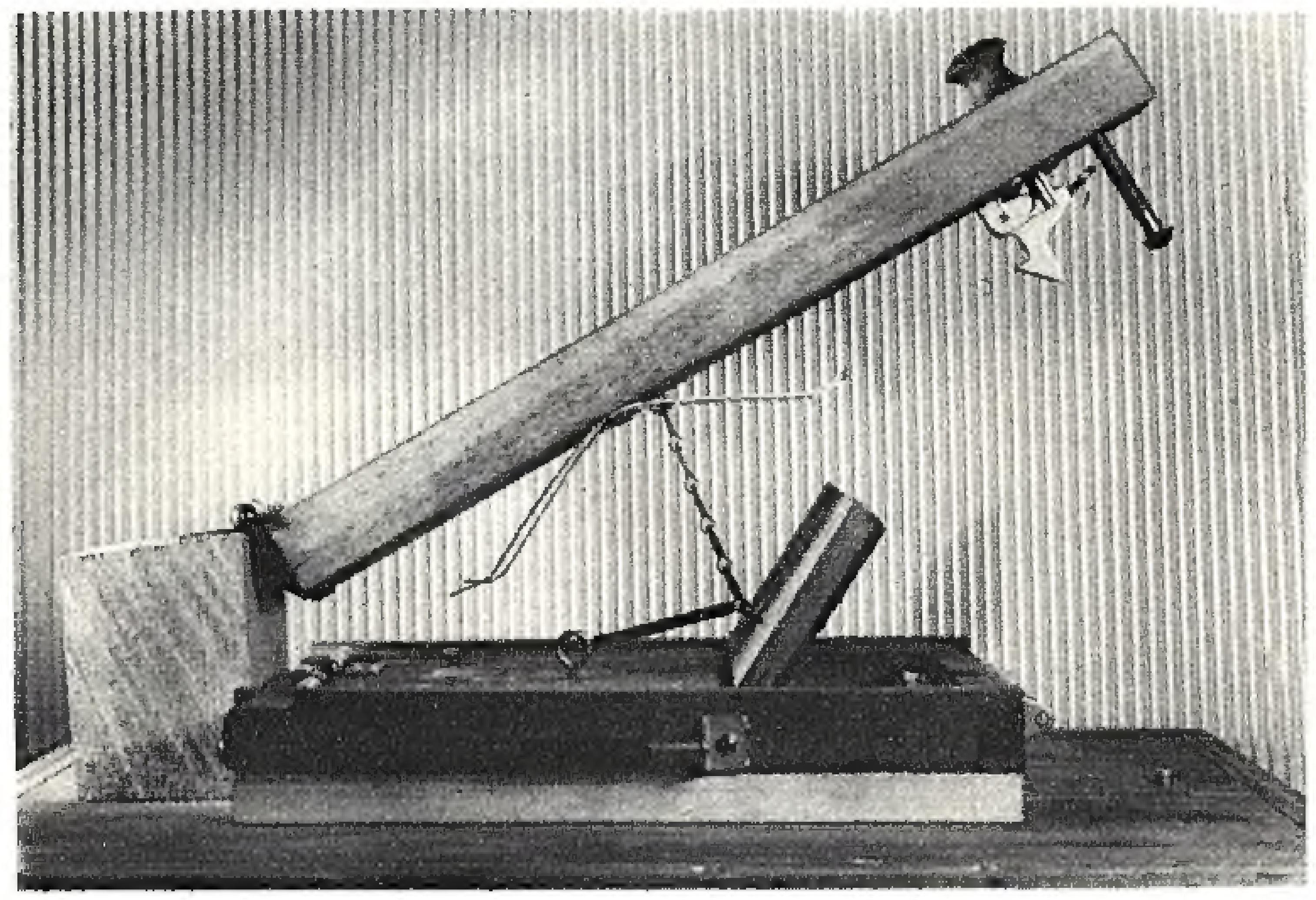
THE PHOTOPRINTER "SIMPLICITY"


BOX FRAMING
3/4" X 3/4"
13"
10"
1" X 2" BLOCK
8 1/2"
11
9"
10 1/2"
6 1/2"
PLATEN LEVER
1" HARDWOOD
10 3/4"
TAPER TO 1" AT END
DRILL HOLE FOR SWITCH PLUNGER AFTER SWITCH IS LOCATED
TOP PANEL OF 1/4" PLYWOOD LIFTS OUT
10"
13"
7"
5"
CUT OUT
2 3/4"
2 3/4
2"
LEVER BLOCK
1/4" X 3/4" STRIP ROUND EDGE
11"
14"
11"
CUT OUT FOR WALL SWITCH
SIDES AND BOTTOM OF 1/4" PLYWOOD
ENDS OF 1/4" PLYWOOD
DETAILS OF LAMP BOX CONSTRUCTION

IF IT is simplicity of construction and low cost that you want in a contact printer, here is the job for you. It is by no means an amateur outfit, however. "Semi-professional" would be a more descriptive term, as it has appointments found on commercial printers and will do work of professional quality at professional speed.

The box of the model illustrated was built of ¼-inch plywood and given a coat of metallic paint. If you wish something really superior, use black tempered Presdwood and finish it with furniture wax. The box is 11 inches high, 11 inches wide and 14 inches long, and is constructed around a framework of ¾-inch square pieces of wood, following dimensions given in the drawing. Attach small wood blocks to each upright member to support an 8½ by 12-inch sheet of glass. The plywood or Presdwood bottom, sides and ends are then attached with brads or screws and finished with ¼ by ¾-inch strips of wood around the top. The latter will then project ¼-inch above the frame so that the top panel can be dropped in place.





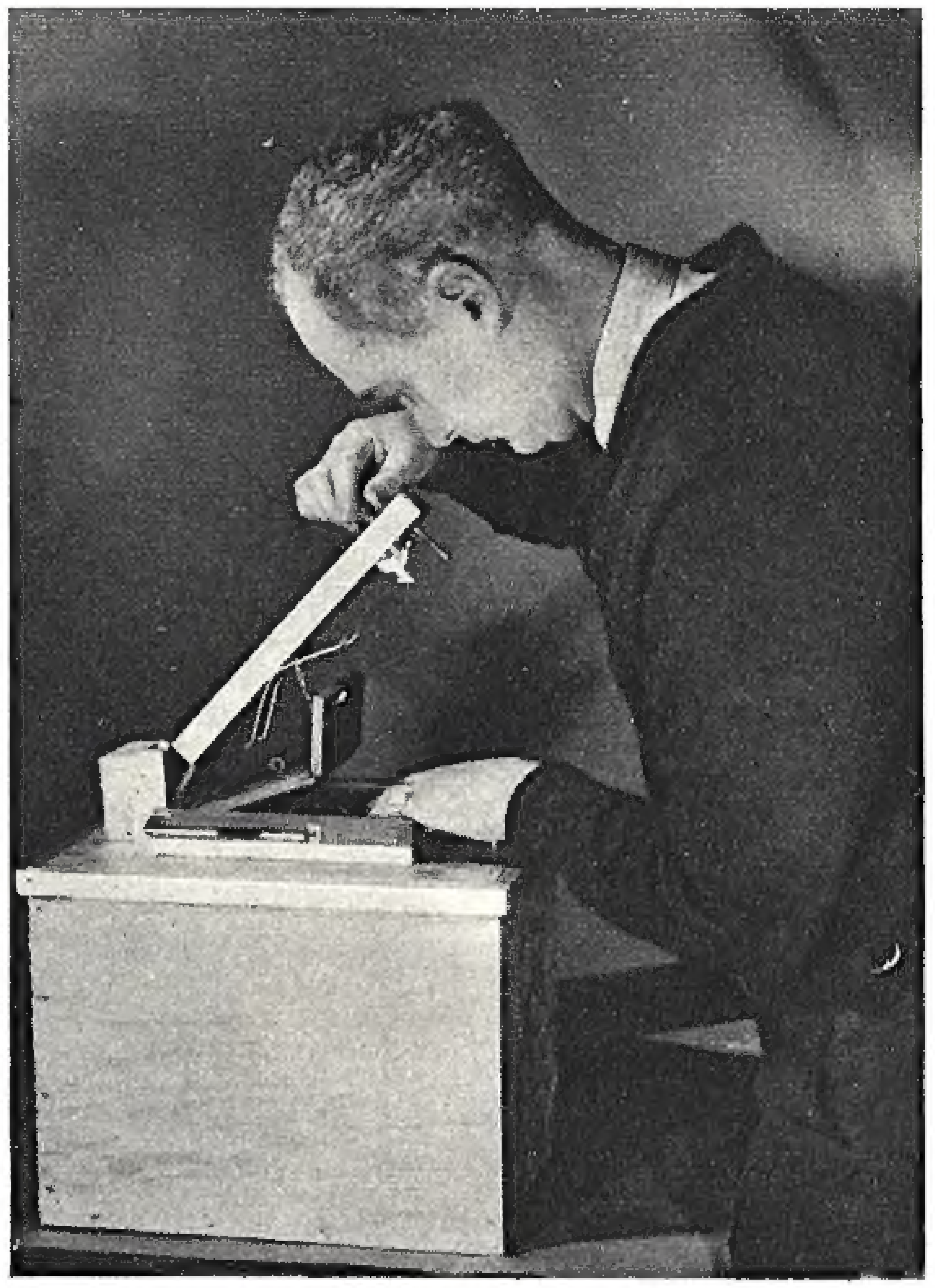
Right: When the lever is lowered, the long screw pushes down the plunger of the exposure switch. The latch may be used to lock the platen for long exposures or local control. Below: The platen lever partly raised to show pressure springs, chain, and coil spring. See construction details above.

Screw five receptacles to the bottom for one 30-watt red or amber pilot light and four 60-watt lamps, and cut an opening in one side of the box for a toggle switch. This lights the pilot lamp and, as you can see from the wiring diagram, the circuit for the 60-watt lamps is automatically closed when negative and paper are brought into contact by lowering the platen. This is accomplished with an automobile stop-light switch which is screwed to one end of the box so that the plunger, which should be reversed in its housing, projects ¼-inch above the top.

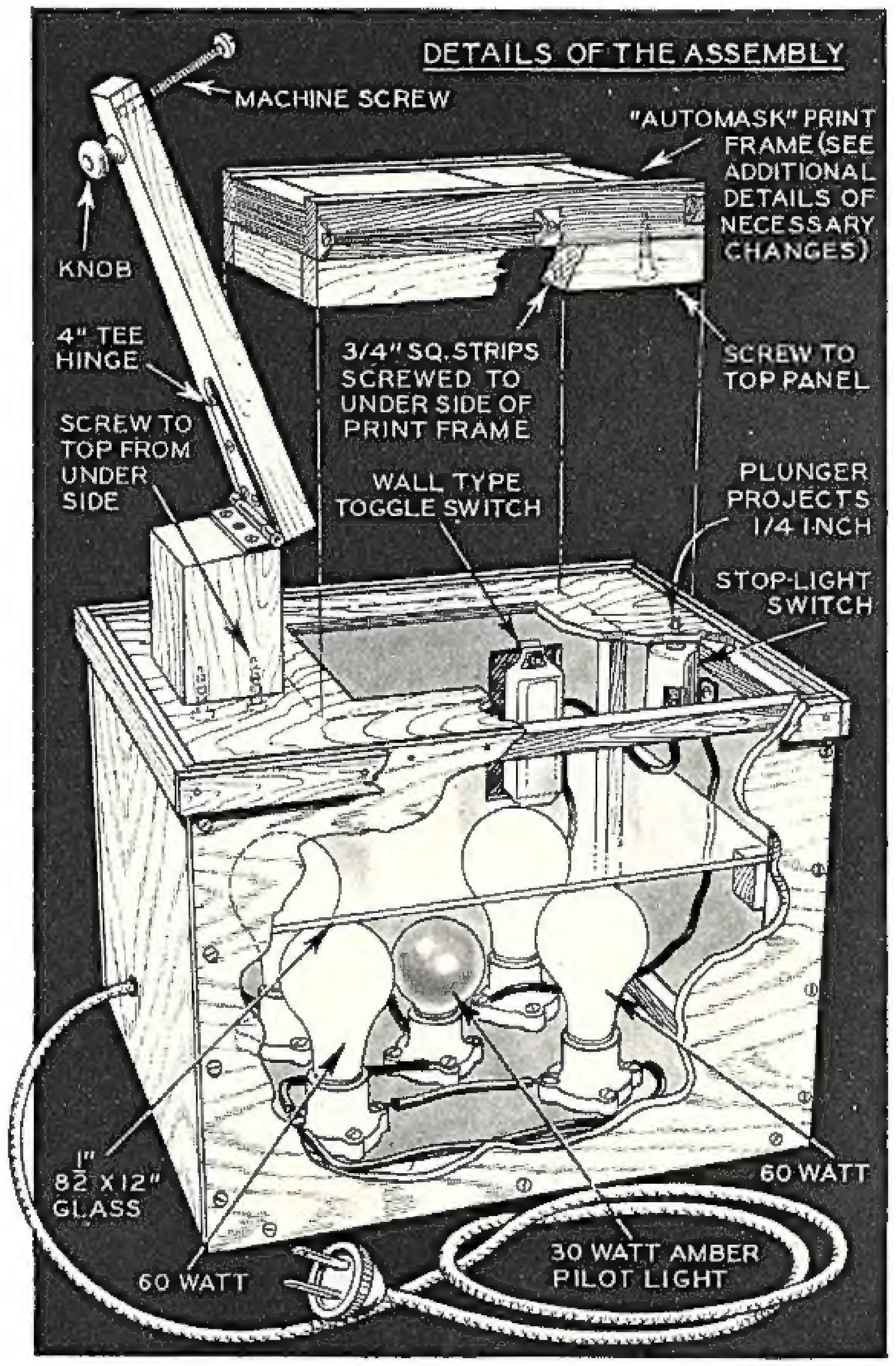
On the sheet of glass you may lay one or more sheets of tissue paper for adequate diffusion of the light. For special effects, or negatives of uneven density, the tissue should be positioned accordingly.

In order to make prints having real quality, it is necessary that the negative and paper be held in perfect contact. Accuracy in this respect being important, in order to simplify

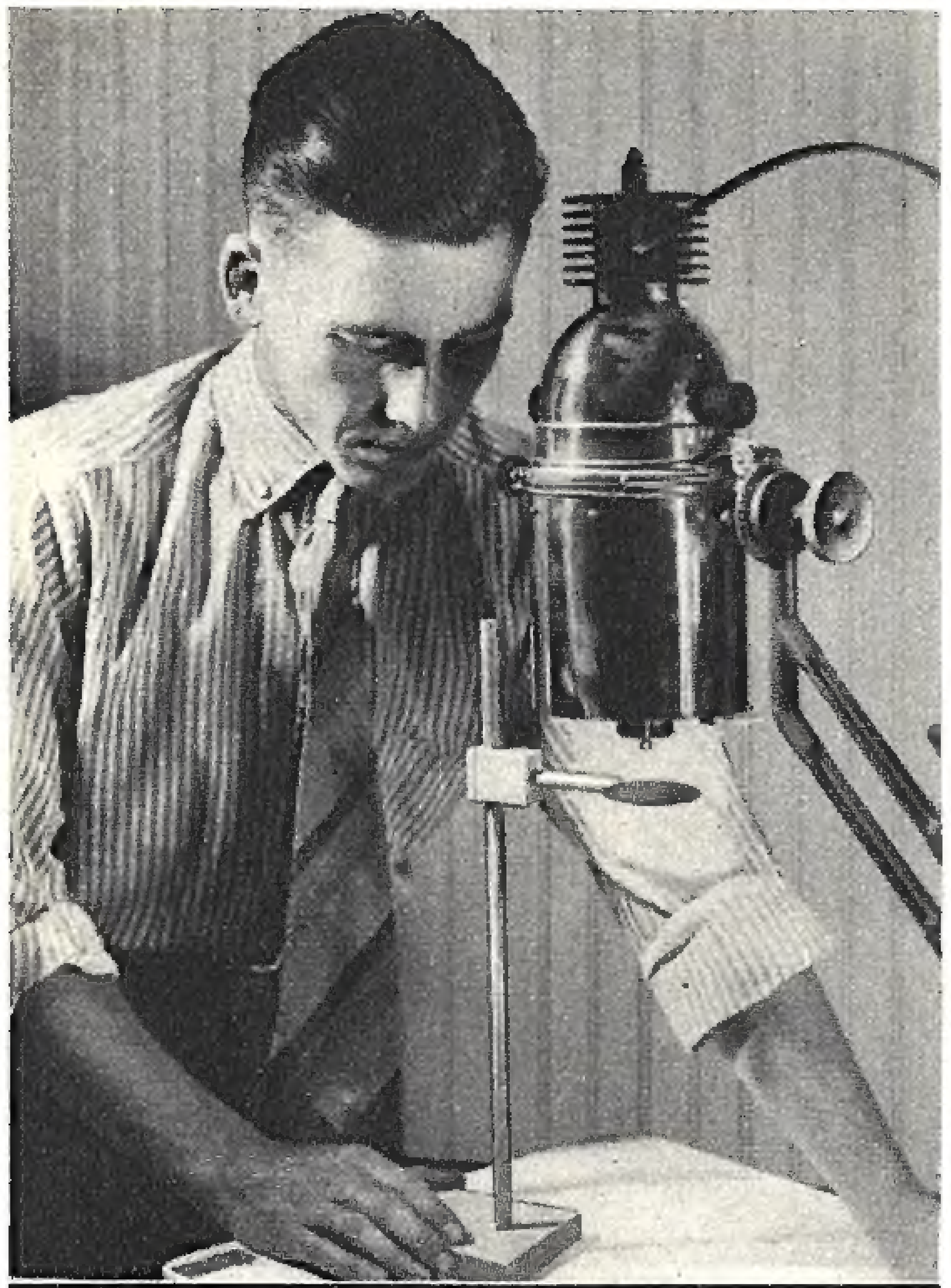
The top of the printer may be raised for "local control" or to give additional exposure to any part of the print with a concentrated beam of light, such as obtained from a "pen light" flashlight.



This easily-made photoprinter will enable you to turn out perfect contact prints in the least possible time. It is a valuable addition to any dark room.


DETAILS OF THE ASSEMBLY
MACHINE SCREW
KNOB
4" TEE HINGE
SCREW TO TOP FROM UNDER SIDE
"AUTOMASK" PRINT FRAME (SEE ADDITIONAL DETAILS OF NECESSARY CHANGES)
3/4" SQ. STRIPS SCREWED TO UNDER SIDE OF PRINT FRAME
SCREW TO TOP PANEL
WALL TYPE TOGGLE SWITCH
PLUNGER PROJECTS 1/4 INCH
STOP-LIGHT SWITCH
8 1/2" X 12" GLASS
60 WATT
60 WATT
30 WATT AMBER PILOT LIGHT

DARKROOM SHORTCUTS



Separate Filter Avoids Vibration

The simple filter holder shown above removes the possibility of moving the enlarger as sometimes happens, when the built-in filter is turned in or out of the light beam. The entire assembly can be made of wood. The base should be no larger than necessary for supporting the filter solidly. It then can be moved out of the way without touching enlarger.

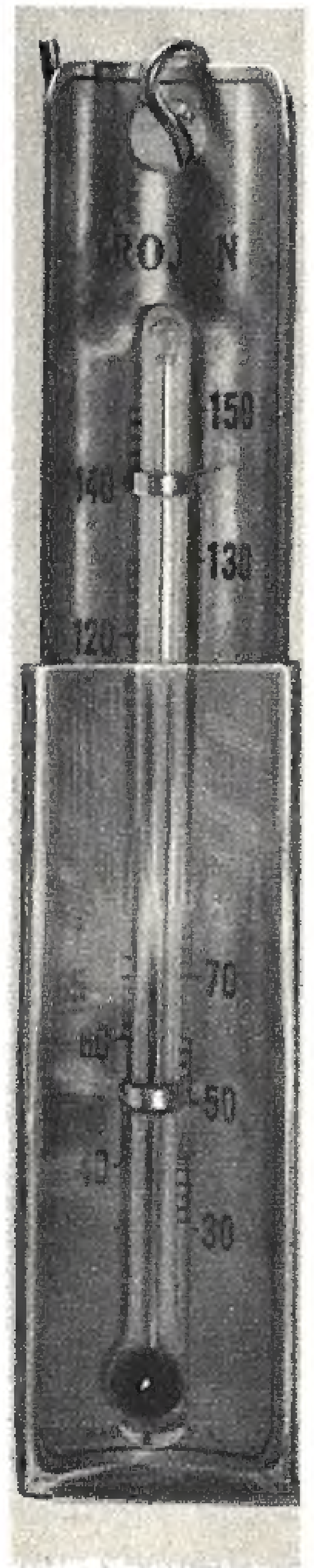
WARDS
VALVE GRINDING
COMPOUND

Removing Trademark From Photo Lamps

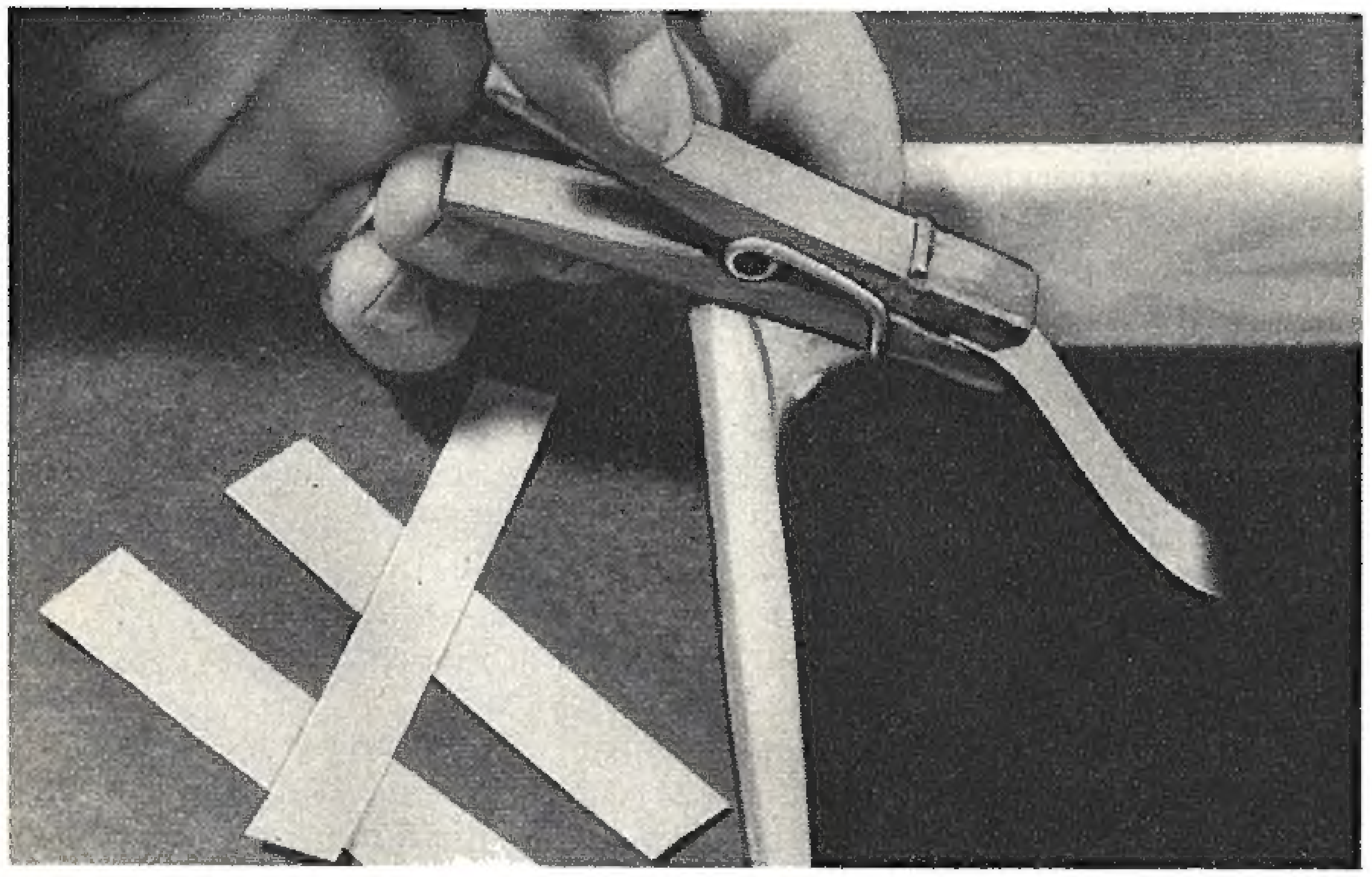
The trademark found on most light bulbs used for enlarging purposes can be removed easily and quickly by rubbing it with a small amount of ordinary valve-grinding compound.

Celluloid Protects Thermometer

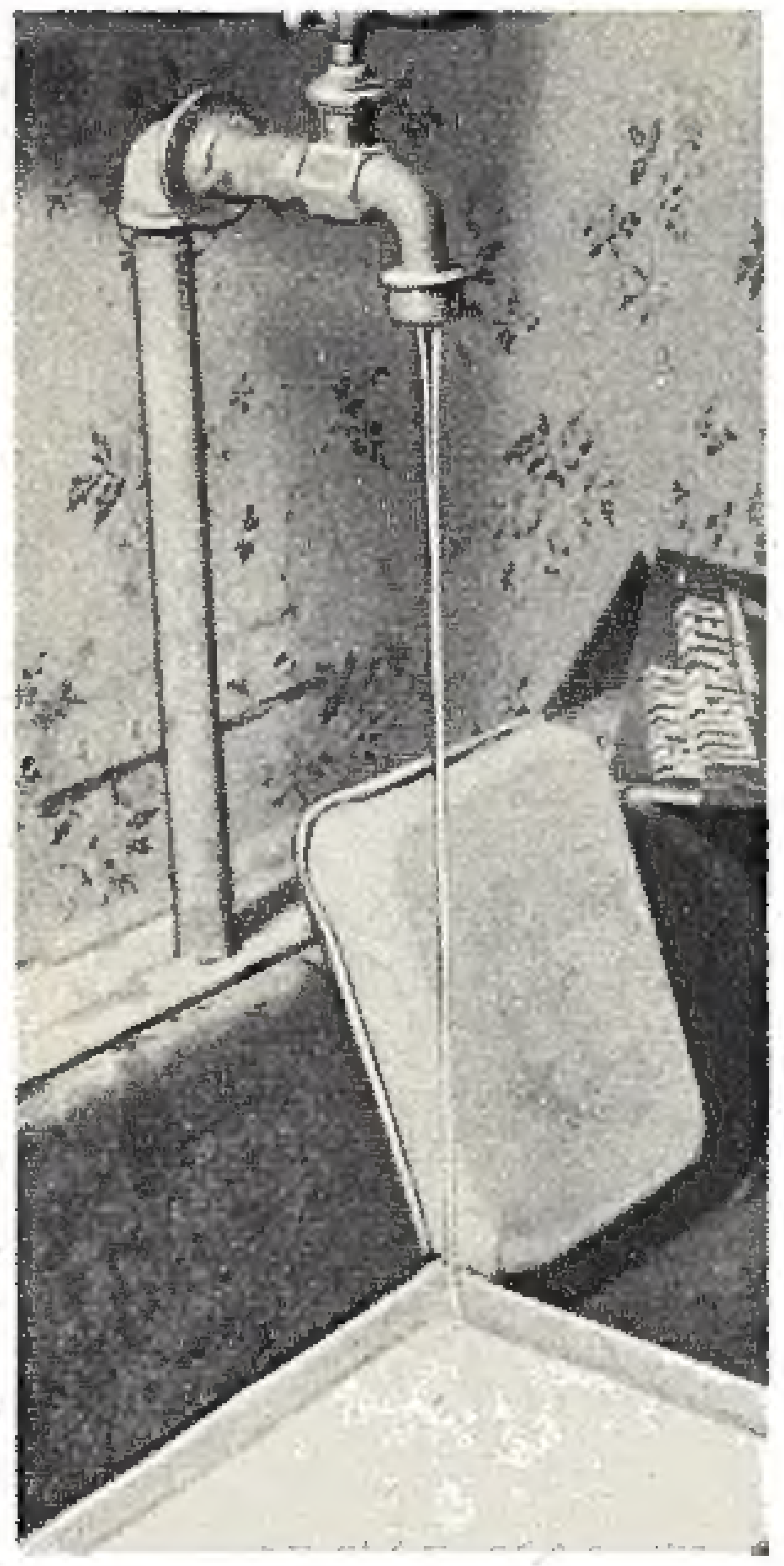
The bulb and column of a tray or tank thermometer can be protected against breakage with a piece of clear celluloid. Wrap it around the thermometer and weld the joint at the rear with a drop or two of acetone.



Test Paper For Hypo



Hypo test strips can be made easily and inexpensively by soaking white paper in a strong solution of potassium permanganate and water. After the strips have dried thoroughly, they are ready for use. Dip them in the water to be tested and if the deep purple color fads, hypo is present.



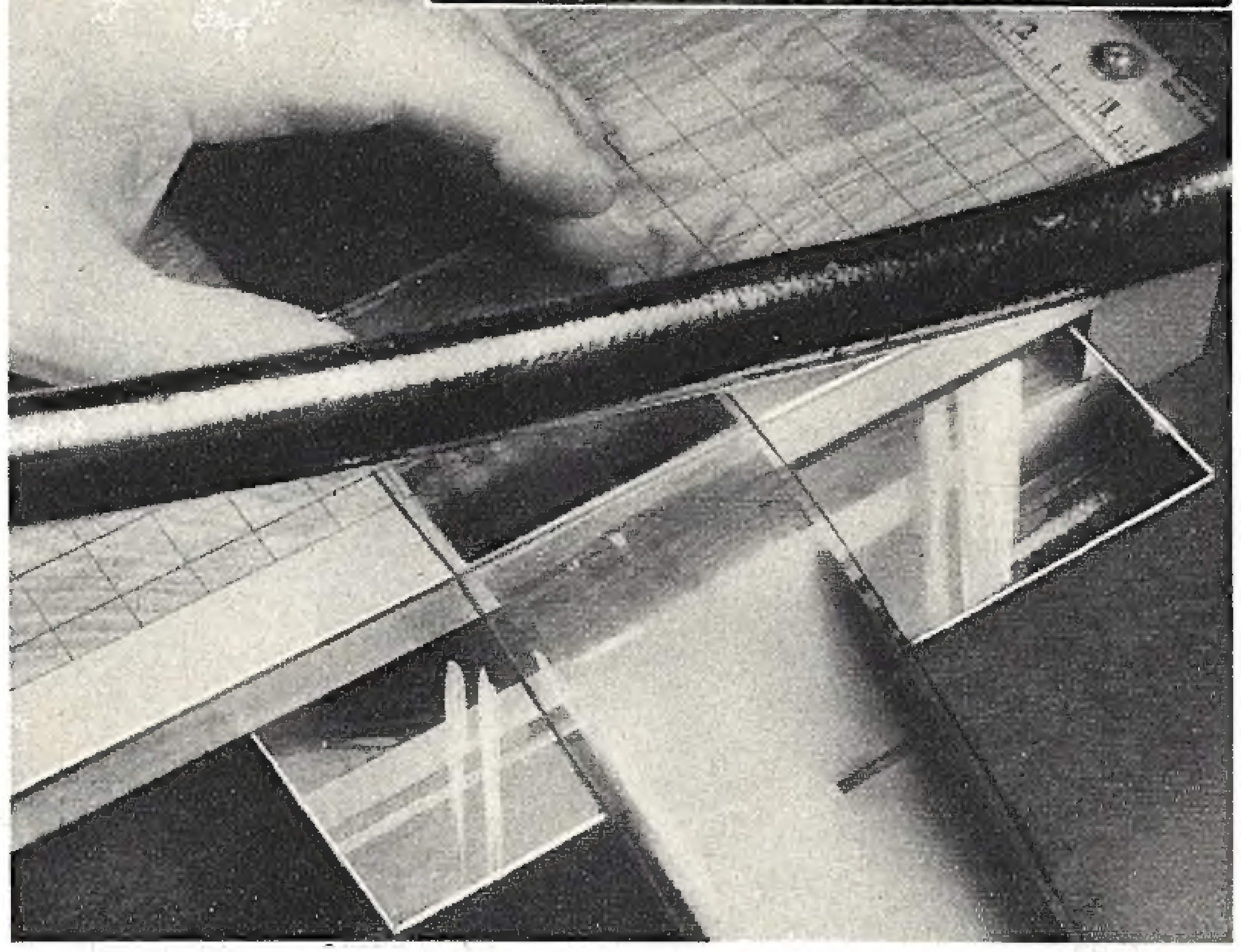
Faucet Strainer Aids Print Washing

Prints can be thoroughly washed in an ordinary tray by fitting the water faucet with a 5 cent strainer, which causes the water to fall in a uniform stream. Adjust the position of the tray so that the stream strikes the edge of the tray lip, and the prints will be kept apart by the circulating water.

Adhesive Finishes Hold-down Glass

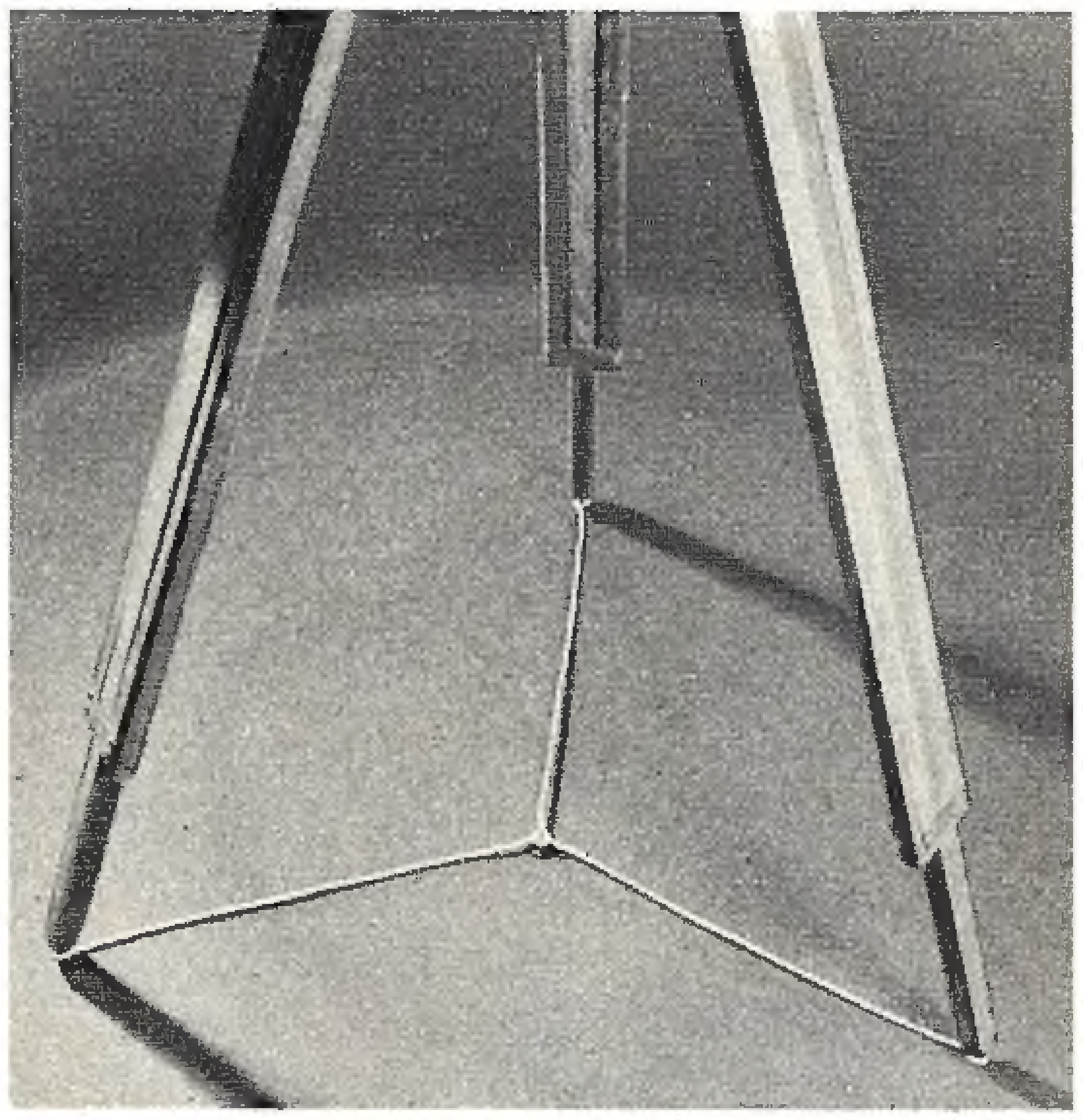
The sheet of glass used to hold down enlarging paper on the easel will be easier to handle if the edges are covered neatly with a strip of adhesive tape. Use tape wide enough to extend about one-quarter of an inch over each edge when it is folded.

Mirror Attachment For Trimmer

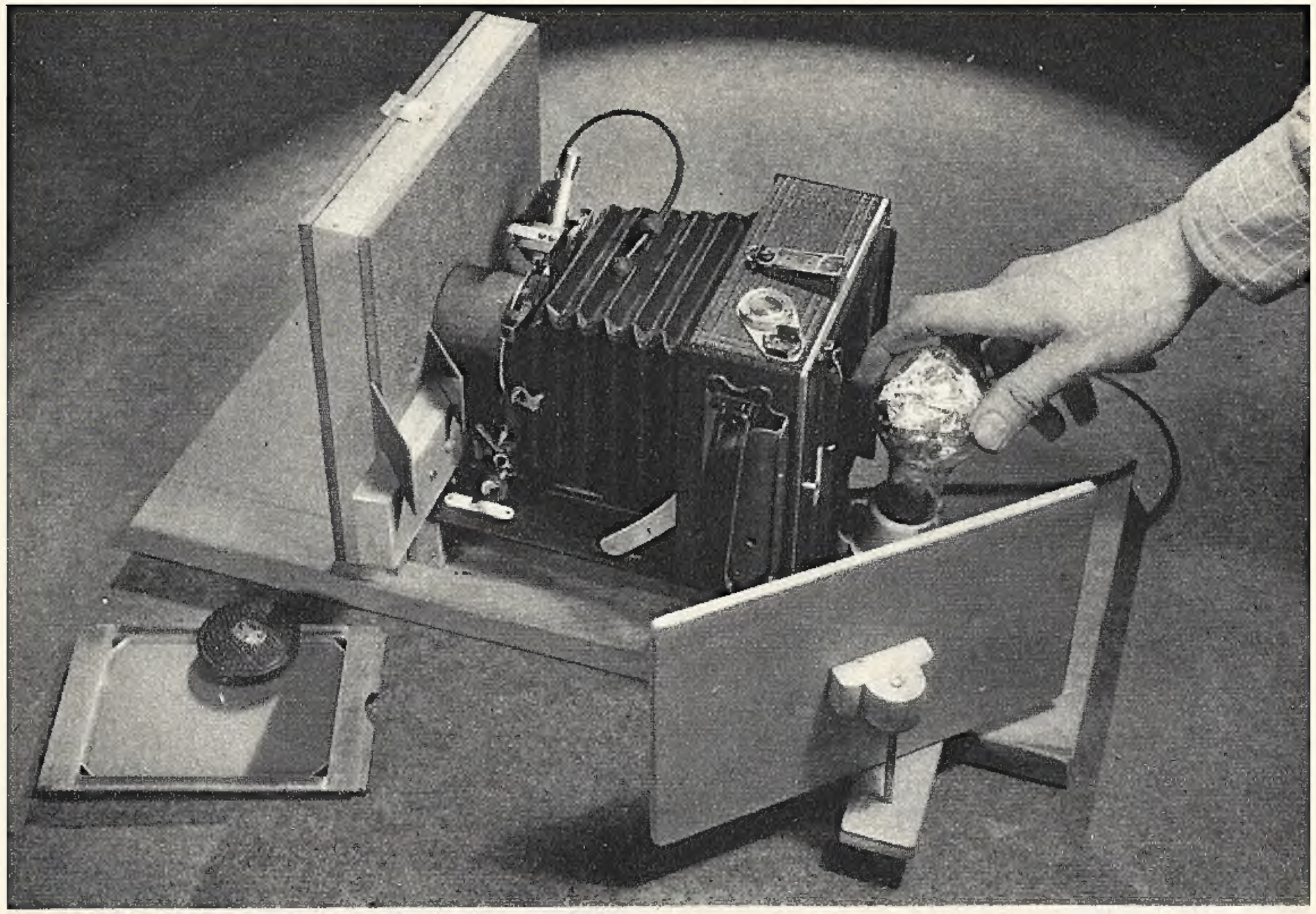


By mounting a small mirror to the base of a paper cutter, just below the blade, sufficient light will be reflected to the portion of the paper to be cut to assist materially in the operation. A long narrow strip of mirror will be found to be the most satisfactory shape. If the material to be cut is not too wide, a small pocket mirror can be placed on the table under the cutter. This size mirror will be large enough for films of the 35 mm. or slightly larger size.

Wires Hold Tripod

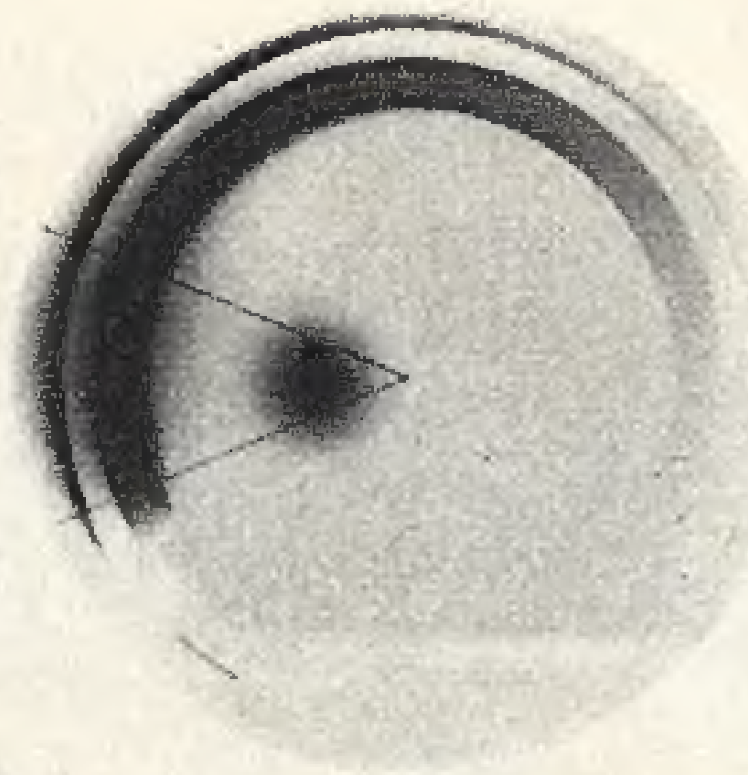


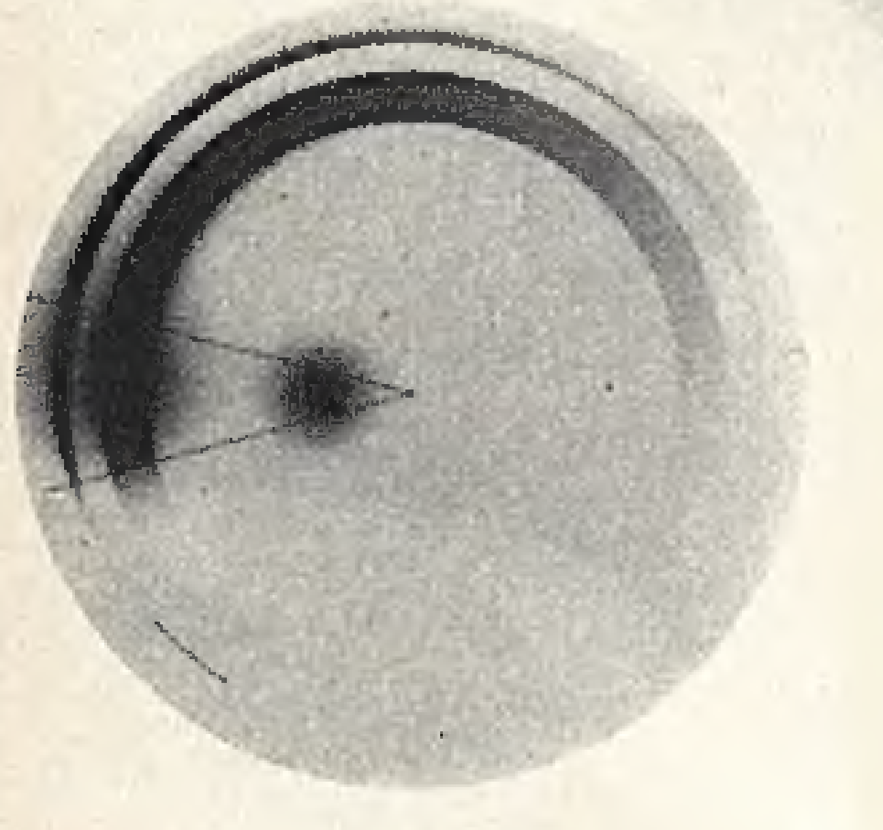
Cut three 15-inch lengths of galvanized wire and bend the ends into loops with one end of each fastened together. They can then be placed on the floor with the tripod legs resting in the outside loops, preventing them from slipping on any smooth surface. This simple device will do much to prevent accidental damage to a camera by having the tripod slip on a smooth floor. Also, the tripod can be moved easily over the floor with legs remaining in their respective positions.



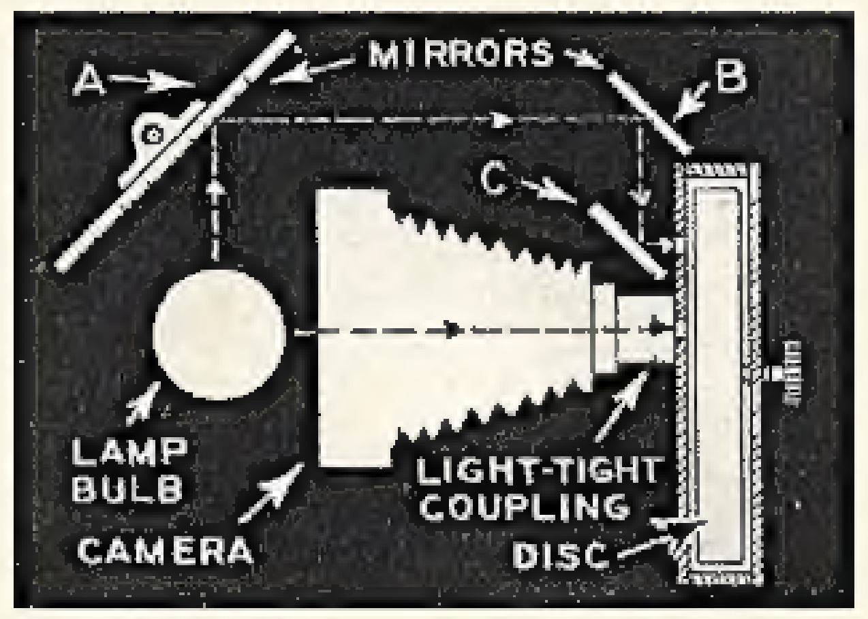
The completed tester from the mirror side. Note that large mirror, whose back is toward the camera, can be adjusted for angle. Back of camera has been removed.

Build Your Own Photoflash Synchronizer Tester





Right: Specimen test disc, showing synchronization at 1/100 second shutter speed, with a small, wire-filled photoflash lamp. From the center outward are seen the shutter tracing, arc showing duration and variable intensity of the flashbulb output, and a third arc, made by two holes showing direction of rotation. Note broad peak of lamp output as indicated by dense region. The synchronizer is a trifle early in its operation, but still well on the peak. Left: Record of foil-filled lamp (small size), at 1/200 second. Note narrower peak as compared to record of wire-filled bulb.


A
MIRRORS
B
C
LAMP BULB
LIGHT-TIGHT COUPLING
CAMERA
DISC

Left: Arrows show direction of light through camera.

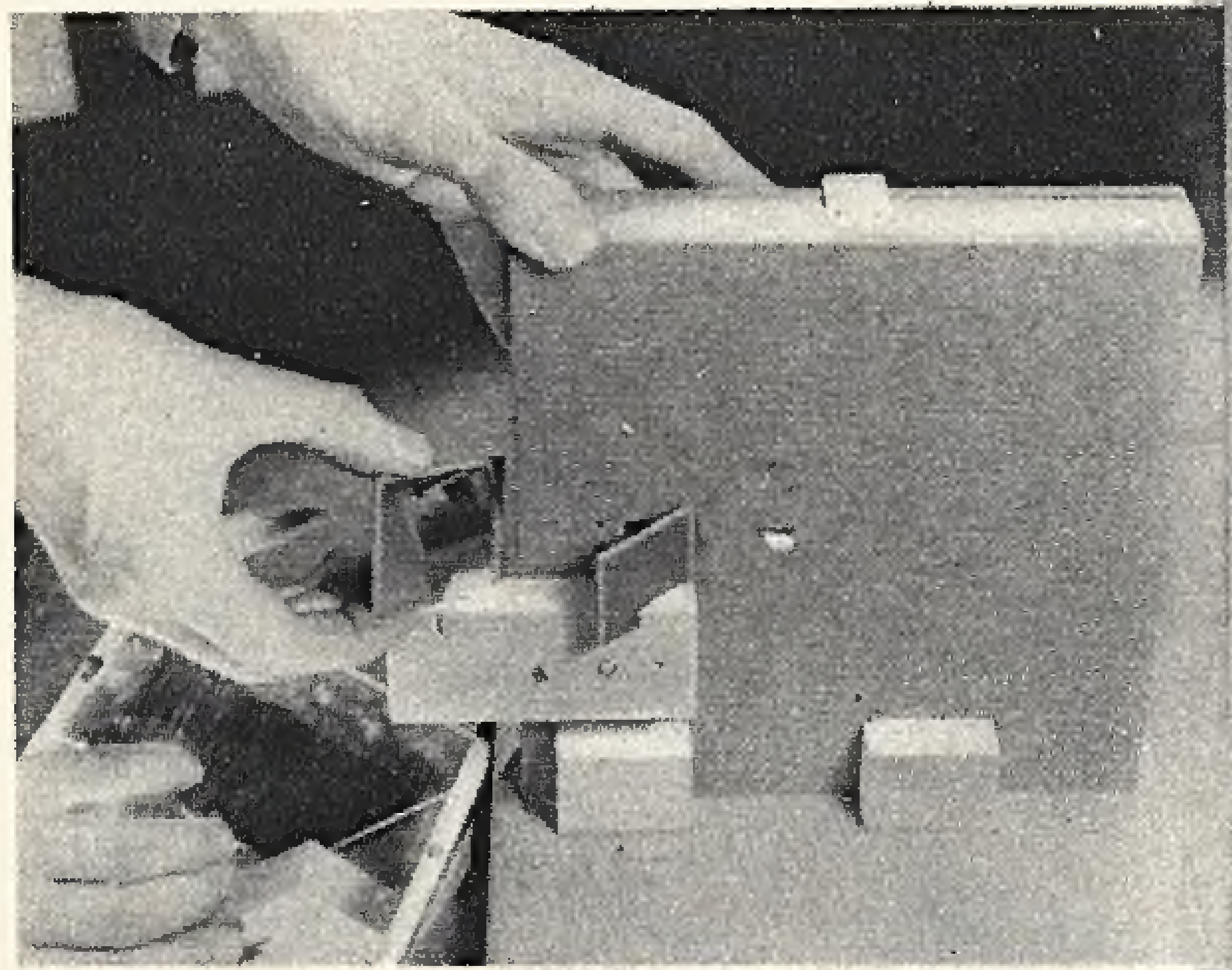
by Walter E. Burton

PHOTOFLASH synchronizers, increasing rapidly in popularity among amateur photographers as well as professionals, are mechanical devices for operating camera shutters in conjunction with photoflash lamps. For best results, the shutter should be open at the instant the photoflash lamp is burning at its greatest brilliancy. Usually the photographer has to trust to luck and the synchronizer manufacturer, and hope that his shutter is winking at the right time. But with a simple testing device, which anyone handy with tools can build for a few cents, the accuracy of synchronization can be checked with precision sufficient for ordinary purposes.

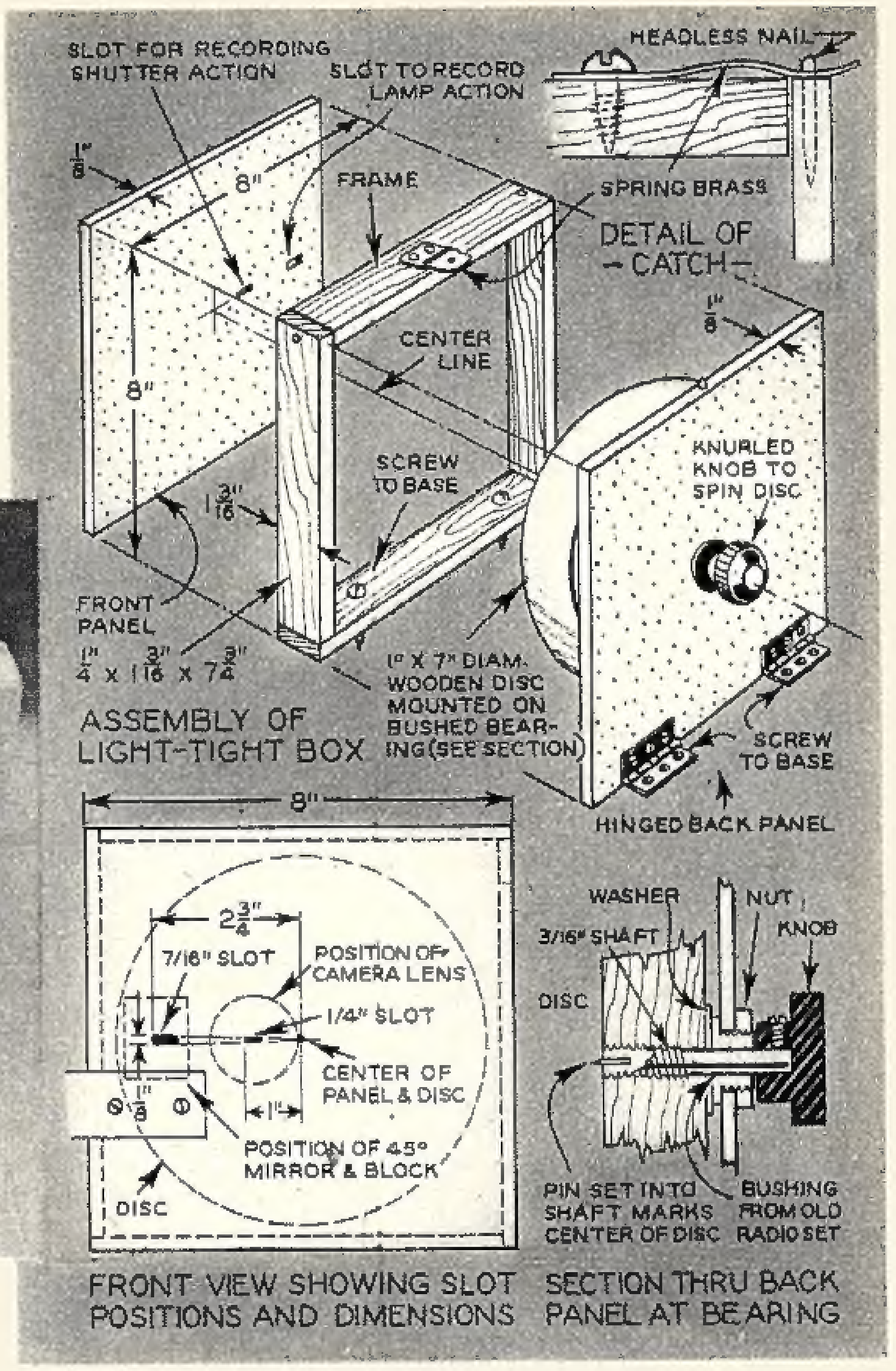
A photoflash lamp, although it seems to the eye to produce an instantaneous flash of light, really burns in a characteristic manner over a definite period of time. The foil or wire inside the bulb is ignited by the filament or starter, rapidly flares up to maximum brilliancy, and then dies down and finally goes out. The entire flash may last but 1/50 second; and during that period the actual peak of light may last for only 1/200 second. The newer lamps are designed to produce a broad, even peak, to make synchronization more certain. The problem of synchronizer adjustment is to match the shutter and lamp actions so that the shutter will be open while the lamp is at the peak of light emission. Usually shutter speeds on the order of 1/100 and 1/200 second are employed, although much higher ones up to and beyond 1/1000 second can be used.

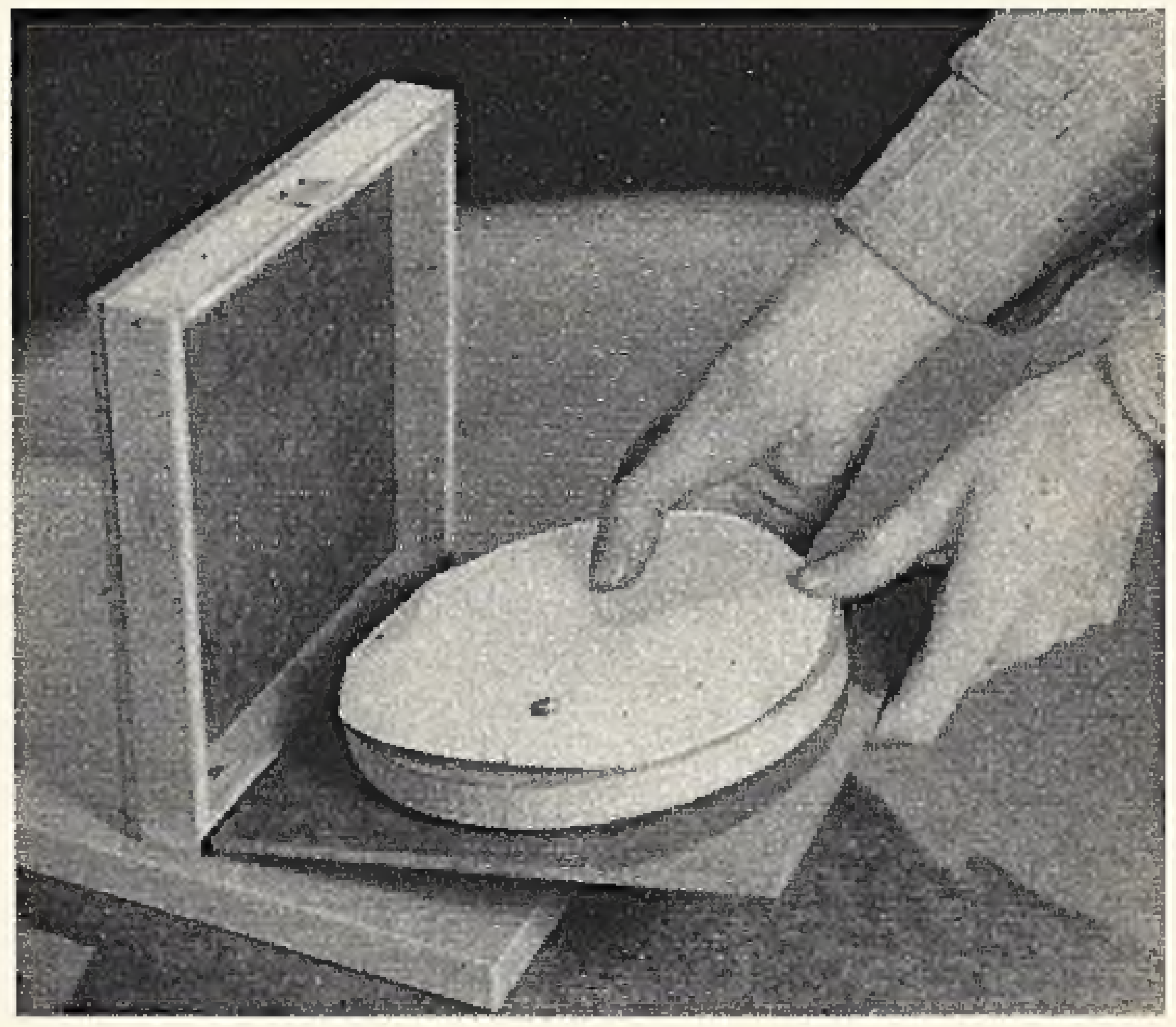
The tester illustrated by the photographs and drawings was designed primarily for use with cameras having between-the-lens shutters, the type usually employed with synchronizers.

Briefly, the operation of the tester is: A disc bearing a sheet of bromide enlarging paper is rotated inside a light-tight box. There are two holes in the box, one directly opposite the center of the lens whose shutter is being synchronized, and about 1 inch to one side of the center of the rotating disc. The second hole is about 1¾ inches farther from the center. A photoflash lamp is placed in a socket directly in line with the first hole and the lens and shutter. A system of mirrors, arranged somewhat like those in a periscope, carries light from the flashbulb into the second hole. Thus light from the lamp reaches the disc of sensitive paper through two holes, one by way of the mirrors,

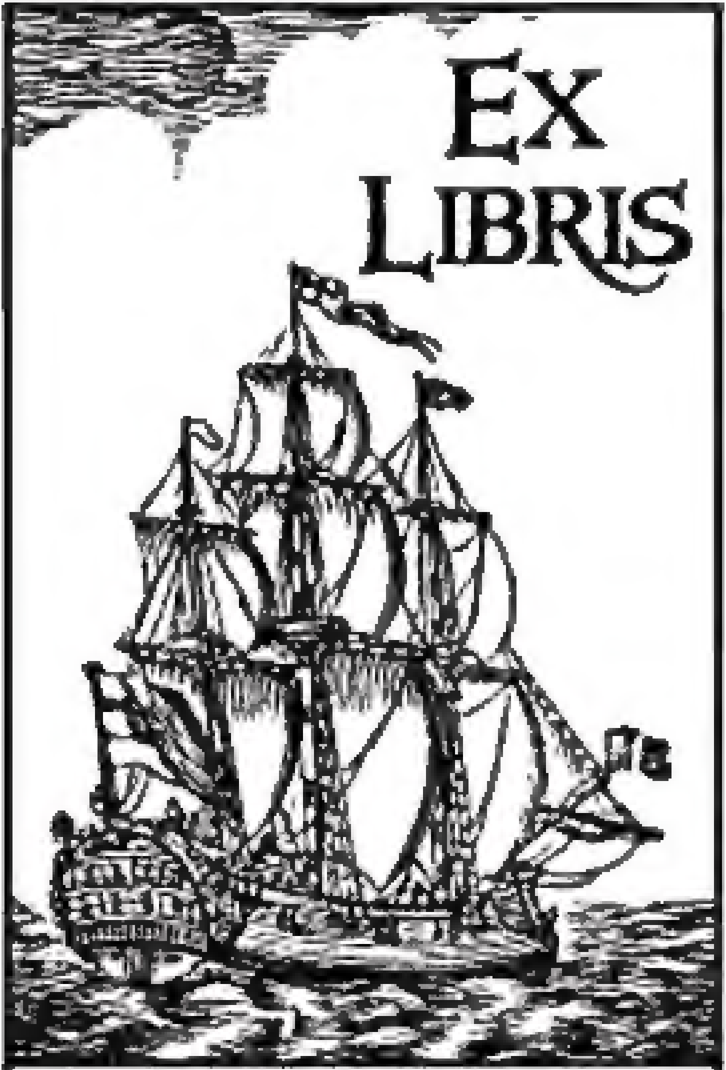


Light from the photoflash lamp is carried, by means of three mirrors, to the opening that traces the complete flash cycle on the rotating disc. The two small mirrors shown are set at angles of 45 degrees to the panel.


SLOT FOR RECORDING SHUTTER ACTION
SLOT TO RECORD LAMP ACTION
HEADLESS NAIL
1/8"
8"
FRAME
SPRING BRASS
DETAIL OF CATCH
1/8"
CENTER LINE
8"
KNURLED KNOB TO SPIN DISC
SCREW TO BASE
1 3/16"
FRONT PANEL
1/4" x 1 3/16" x 7 3/4"
1" X 7" DIAM. WOODEN DISC MOUNTED ON BUSHED BEARING (SEE SECTION)
ASSEMBLY OF LIGHT-TIGHT BOX
SCREW TO BASE
HINGED BACK PANEL
8"
2 3/4"
7/16" SLOT
POSITION OF CAMERA LENS
1/4" SLOT
CENTER OF PANEL & DISC
1/8"
1"
POSITION OF 45° MIRROR & BLOCK
DISC
WASHER
NUT
KNOB
3/16" SHAFT
DISC
PIN SET INTO SHAFT MARKS CENTER OF DISC
BUSHING FROM OLD RADIO SET
FRONT VIEW SHOWING SLOT POSITIONS AND DIMENSIONS
SECTION THRU BACK PANEL AT BEARING



Thumbtacking a bromide paper record sheet to the wooden disc preparatory to making a test. This is done in the darkroom, by a suitable safelight lamp.



Anon. Malefactor